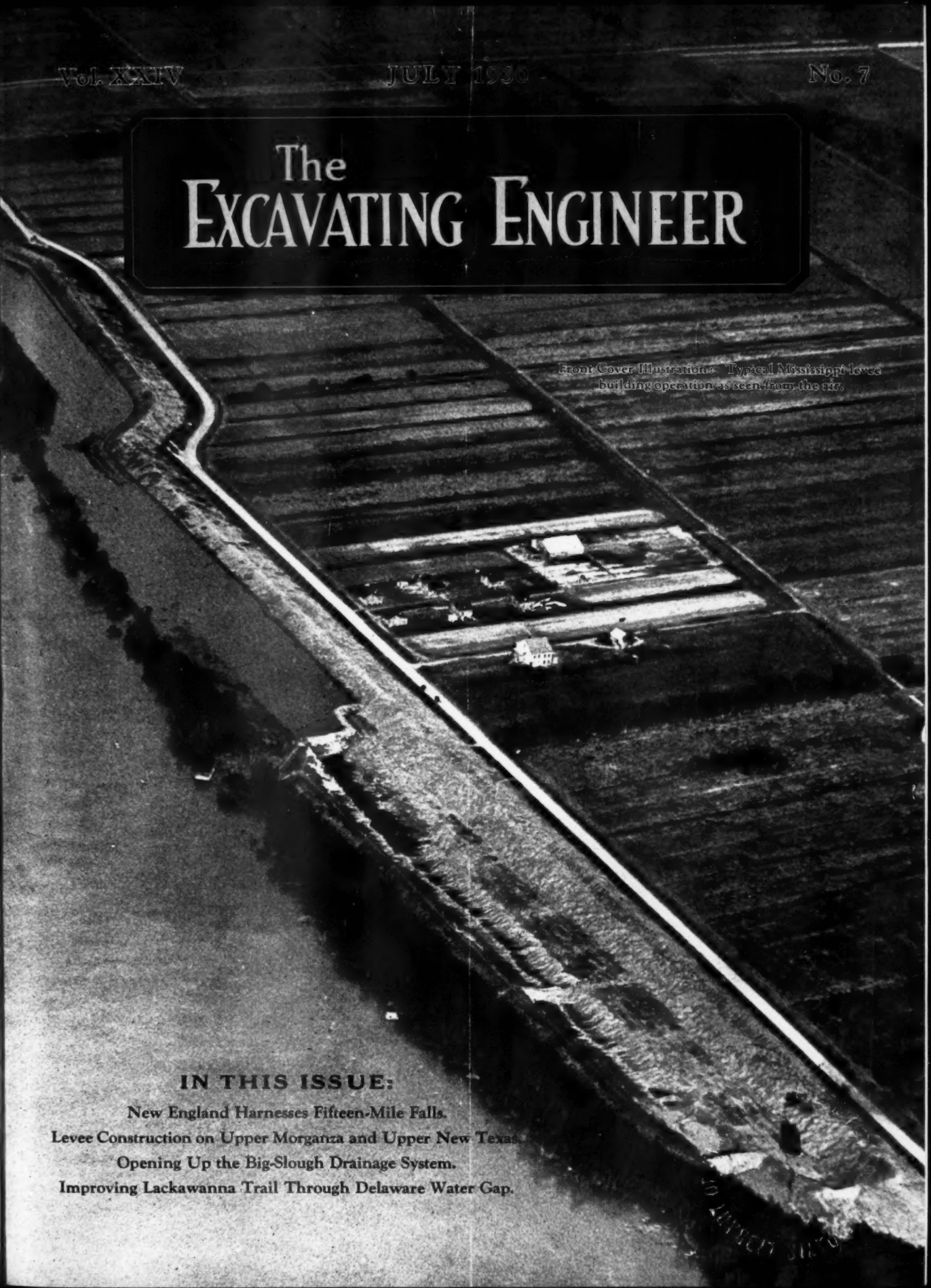
Vol. XXIV JULY 1936 No. 7

The EXCAVATING ENGINEER



Front Cover Illustration: Typical Mississippi levee building operation, as seen from the air.

IN THIS ISSUE:

New England Harnesses Fifteen-Mile Falls.
Levee Construction on Upper Morganza and Upper New Texas
Opening Up the Big-Slough Drainage System.
Improving Lackawanna Trail Through Delaware Water Gap.

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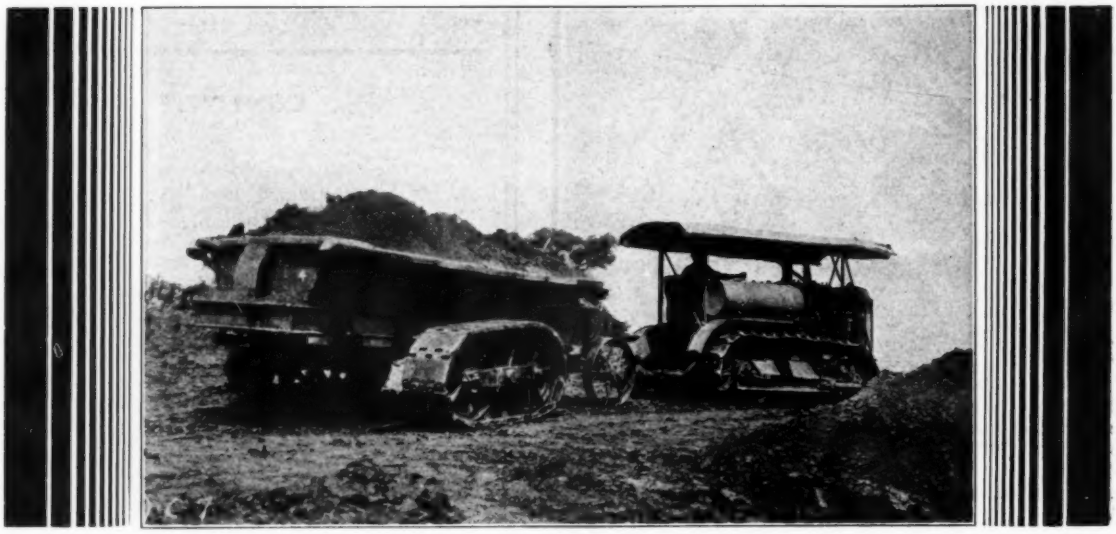
Built To Lick Your Hauling Problems



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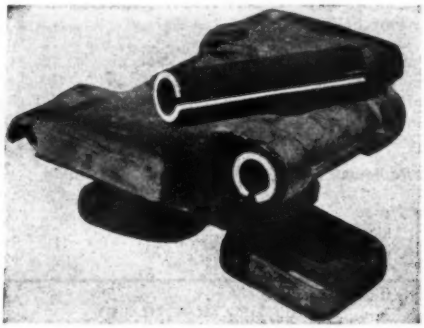

A single track shoe showing design and inserted position of the hardened steel bushing, keyed to prevent turning, yet easily removable and reversible for wear.

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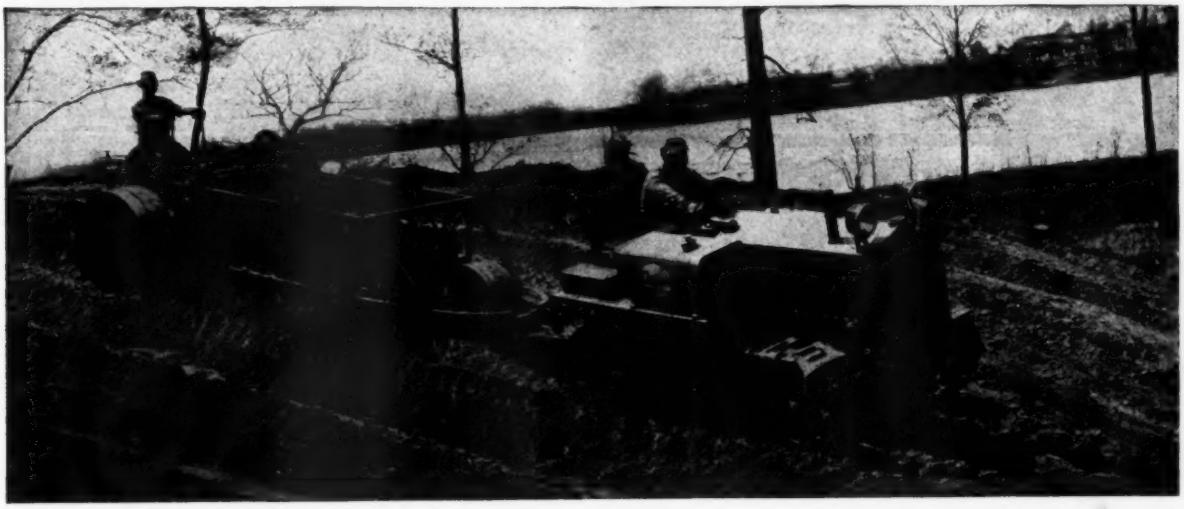

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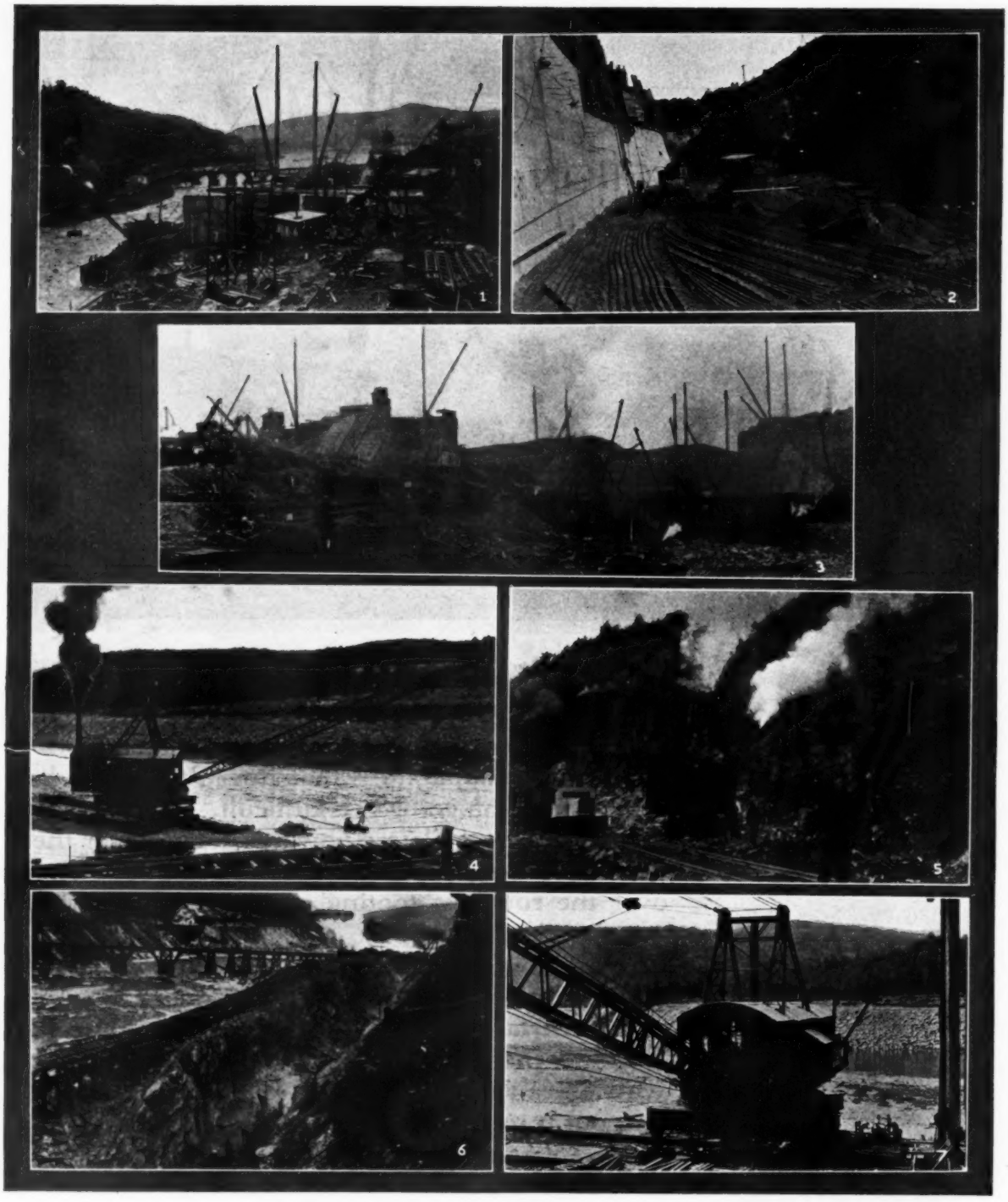

Action Pictures on Lower Development

1. General view of dam construction looking downstream. Work in lower left center is for the cofferdam at the head of the diversion channel.
2. Sanders Engineering Company's bulldozer (Caterpillar-powered) and roller at work on the earth dyke behind the New Hampshire retaining wall.
3. As the concrete is poured a network of masts rises against the sky like the giant spars of some fantastic fleet of fishing vessels.
4. Northern Construction Company's big Bucyrus-Erie 6-yard dragline in action on tailrace earth excavation.
5. Osgood steamer loading the Plymouth-drawn Westerns in the quarry while jackhammers in upper right make hole.
6. Rock excavation in the diversion channel from which some 60,000 cubic yards of rock was loaded largely by hand into skips.
7. Bucyrus-Erie 320-B dropping a coal-hoist bucket which the pitmen will fill during the next cycle.

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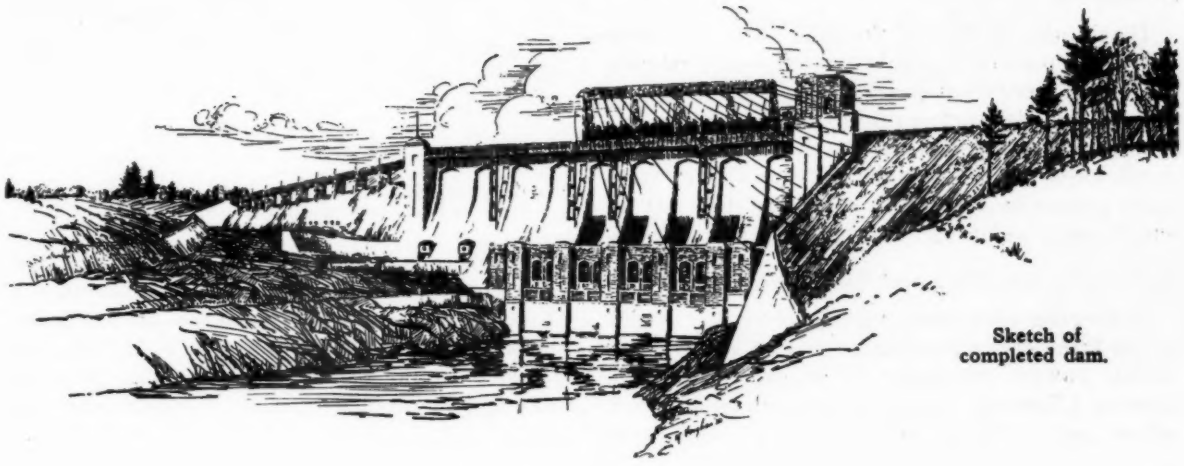
New England Harnesses Fifteen-Mile Falls



Sketch of completed dam.

Lower Development of falls on Connecticut River will yield 200,000 horsepower to serve 250 New England communities.

IN the northern part of the New England states, among the green-clad hills of Vermont and New Hampshire, the Connecticut River drops more than 320 feet in the short space of 20 miles.

The greater part of this fall comes in 15 miles of tumbling, rushing waters, and this white water is known as the Fifteen-Mile Falls. Hitching up this 15 miles of falls will add more than 375,000 h.p. to the electric power available in New England. When completed, this Fifteen-Mile Falls development, together with the rest of the network owned and operated by the New England Power Association, will constitute the largest hydro-electric power development east of the Niagara.

The project calls for two dams, each one 175 feet high together with power houses. Near the mouth of the Passumpsic River the lower dam is being built, creating a lake eight miles in length. The upper dam, called the Fifteen-Mile Falls Upper Development, to be built at the headwaters of the lower reservoir, is scheduled to follow in the near future and will form a second lake twelve miles long. The combined capacity of these 20 miles of artificial lakes will be well over 91 billion gallons.

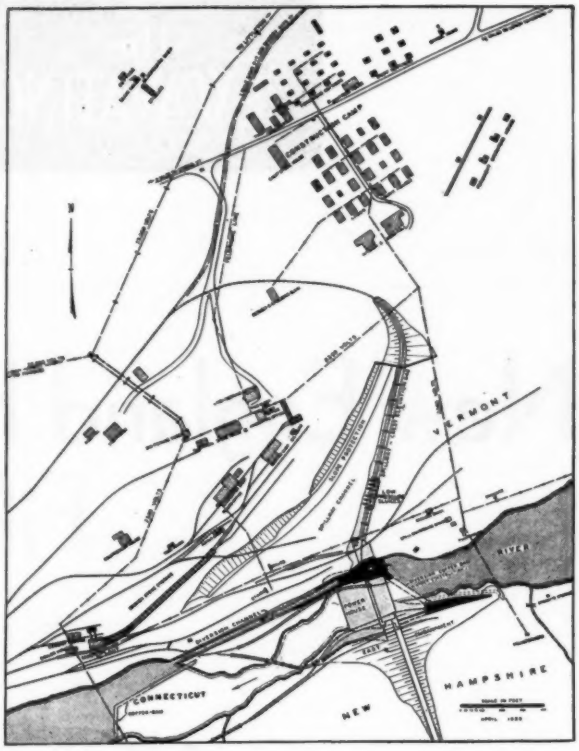
The lower development requires 1,021,000 cubic yards of mixed excavation, 244,000 cubic yards of rock excavation, 368,000 cubic yards of concrete and 4,600 tons of structural steel. It consists of an earth dike on the New Hampshire bank of the river, a mass concrete retaining wall extending upstream and downstream along the New Hamp-

shire river edge, with intake and power house in the river channel, and a concrete non-overflow section of dam on the Vermont shore adjoining the intake. The spillway is located on the Vermont side of the river and is 850 feet long, ranging in height from 20 to 85 feet.

During the construction period the river has been diverted past the site and the flow handled through a channel excavated in the ledge on the Vermont side. To provide this diversion channel it was necessary to excavate some 60,000 cubic yards of rock. Upon the completion of the dam 25,000 cubic yards of concrete will seal this channel.

The concrete retaining wall is of gravity section and extends 450 feet upstream and a like distance downstream from the center of the dam. This wall is founded on bed rock. It is 165 feet high at its mid-section and contains some 84,000 cubic yards of concrete.

The intake section of the dam through which water will pass from pond to power house extends across the river from the retaining wall and is to be provided with racks equipped with a mechanical rake for trash removal. Water will pass into the scroll cases of the turbines through four steel plate penstocks 19 feet in diameter, 150 feet in length, each weighing close to 190 tons.



Map of Fifteen-Mile Falls Lower Development. Black areas indicate concrete in place, April 1929.

Nature Provides Rock and Sand Close to Dam Site

In keeping with modern methods for the benefit of the large crews handling this vast project, up-to-date camps, consisting of 69 camp buildings housing 1,770 men, a modern hospital, engineering offices and a testing laboratory have been provided. There is even a movie theater seating 600, and an organized police and fire department.

Construction was started August 20, 1928, and is expected to be completed October 1, 1930. The first step in the construction program was the building of a standard-gauge railroad connecting the Lower Development site with the rock quarry

General view of quarry and crushing plant. In the quarry at the left may be seen a Bucyrus-Erie 50-B steamer. The conveyor system at the plant is well illustrated in this view.

General view of excavating operations. In the foreground may be seen the tailrace and the pump house. In the extreme right may be seen the diversion channel. Across the end of this is the diversion cofferdam in place. In the upper left the embankment may be seen going into place.

located along the river, 1½ miles above the dam site, and connecting dam and quarry with the main line of the Canadian Pacific Railroad at Inwood, Vermont.

This 4 miles of railroad runs through a side-hill location, and required the excavation of 75,000 cubic yards of mixed materials. Investigation of rock formations suitable for quarrying revealed a deposit of fine-grained trap rock, located on the side of a steep hill, the deposit having very little overburden and presenting a bare face one-half mile long and 100 feet high. Estimates of the deposit indicate the presence of more than enough rock required for both the Lower and Upper dams.

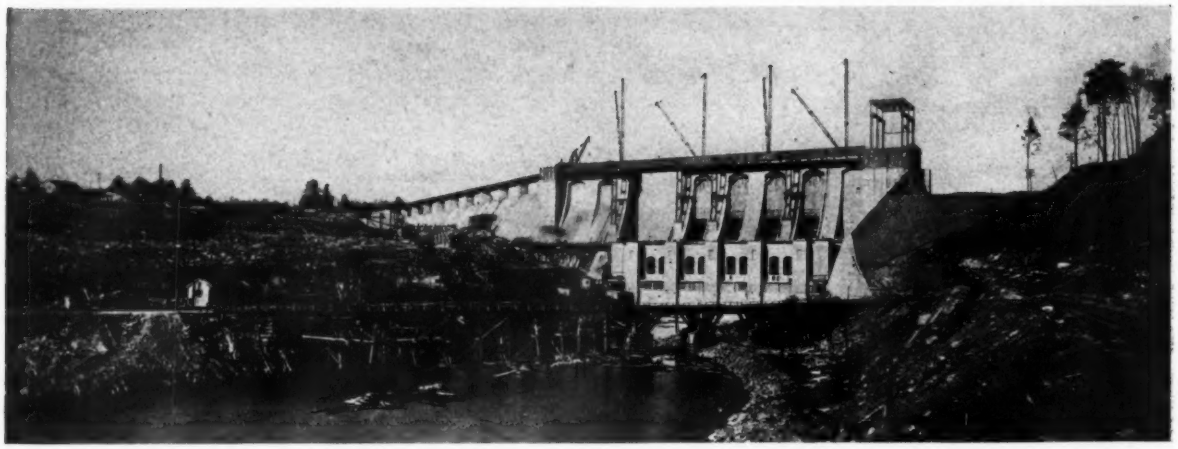
Work on the development of the new quarry progressed rapidly. The crushing plant has a capacity of 100 tons per hour. Rock is loaded from the quarry by two Bucyrus-Erie steam shovels, a 50-B with a 1¾-yard bucket, and a 30-B with a 1¼-yard bucket. Hauling is with 6-yard dump cars pulled by steam locomotives.

An adequate deposit of clean, sharp sand suitable for concrete was found located in a plain lying about one-half mile south of the quarry site. There is but a shallow overburden of vegetation, and the sand is of sufficient depth to afford a favorable working face for excavating and loading by a power shovel. A 1½-yard steam shovel was used to load sand in 6-yard side dump cars until late fall of 1929, when an electric-driven stiff-leg derrick was installed into this operation. The sand was hauled to the concrete mixing plant over the construction railroad.

Half Million Cubic Yards of Earth Fill and Concrete in Retaining Wall

The location of this Lower Development, approximately two miles above the mouth of the Passumpsic River, is in the towns of Monroe, New Hampshire, and Barnet, Vermont, the river forming the boundary. Here, directly at the foot of the Falls, Sanders Engineering Company of Portland, Maine, is building, on the New Hampshire side of the river, the earth dike 1,000 feet at its base and rising 170 feet. For this work the Sanders Engineering Company is using a Bucy-

Completed tailrace excavation with the concrete work of the dam climbing toward its 175-foot apex.



By mid-April of this year the development was about 75% completed. By using a little imagination we can here see the dam as it will appear when finished.

rus-Erie 41-B and two Thews to move from borrow pits the 275,000 cubic yards of selected materials necessary to shape the dike to its required dimensions.

The concrete retaining wall, containing 84,000 cubic yards, rises 165 feet from bed rock at its mid-section, extends 450 feet upstream and a like distance downstream, and is being built by the Connecticut River Development Company.

60,000 Cubic Yards of Rock Chiseled Out of Ledge for Temporary River Channel

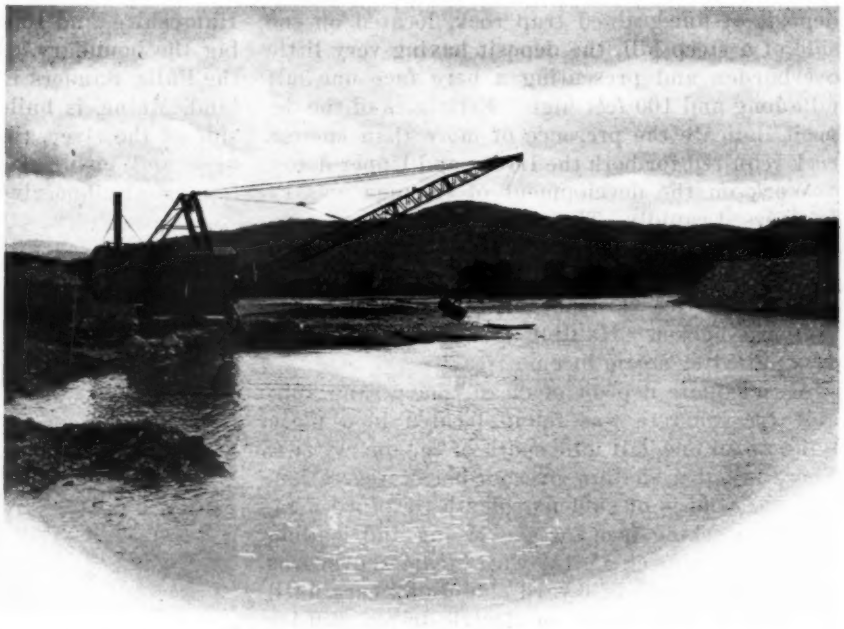
At a point just above the power house site a cofferdam has been built, diverting the river past the construction site to a channel excavated in the ledge on the Vermont side, which carries the flow for a distance of some 1,500 feet. The channel excavation, carried on by the Connecticut River Development Company, called for the removal of some 60,000 cubic yards of rock. This section of the excavation was a side hill through cut, entirely in ledge rock, with a maximum depth of 40 feet. The equipment working on this part of the job included 8 stiff-leg (2 travelling) derricks and one shovel. In addition to these, transportation equipment was needed to remove the material to the Vermont side of the river downstream from the site.

Tailrace earth excavation has been handled by the Northern Construction Company, who in a period of four and one-half months dug 264,000 cubic yards with their Bucyrus-Erie 320-B steam machine, mounted on trucks, equipped as a dragline, swinging a 6-yard bucket.

To handle excess water in times of flood the overflow section of the dam, extending 850 feet along the rock section of the Vermont side, has been designed to provide for a discharge of 120,000 cubic feet of water per second in addition to the capacity of the plant and the flood gates. A suitable discharge channel is being excavated to ledge downstream from this spillway by the Connecticut River Development Company using two steam shovels.

Major J. H. Brace and C. E. Fraser of the

(Continued on page 341.)



Six yards of gravelly river bottom on the way to the new embankment.

Levee Construction on Upper Morganza and Upper New Texas

By Beatrice Cosgrove

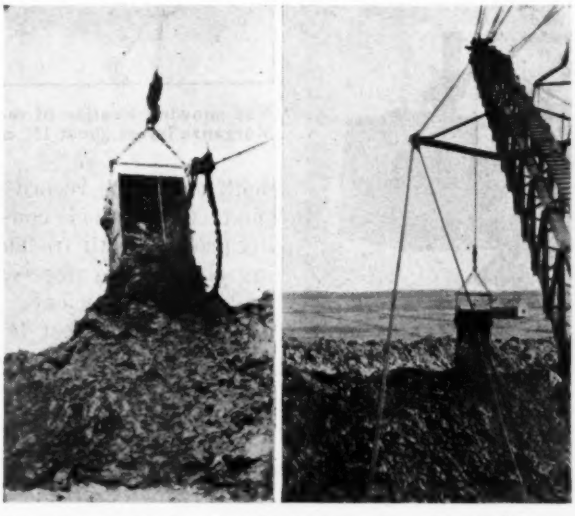
John T. Chambers

J. Hampden Lewis

» » » Lewis-Chambers Construction Company, levee builders of note, help guard 2500 square miles from flood danger at one of the most critical points on the Mississippi.

IT was April 30, 1927. The Mississippi River was on the rampage; a land lay ravaged. New Orleans was safe; the day before, an artificial crevasse had been cut by government engineers. But already a vast sentiment against repetition of the disaster had been aroused. Levees presented a "practical, feasible, and economic solution," declared a joint statement issued by Herbert Hoover, then Secretary of Commerce, and Major-General Jadwin, chief of army engineers, from Memphis, Tennessee. Five months later, addressing the Louisiana Legislature and citizens at Baton Rouge, Louisiana, Mr. Hoover reiterated the statement, avowing the necessity for the "design and construction of such work as will forever prevent its (the Mississippi flood) recurrence." In these two statements lay the germ of the vast system of prevention that has since become known as the Jadwin Plan.

Today, all up and down the Mississippi River, that program is being carried out. In the Second New Orleans district alone, which includes the Mississippi River just below Vicksburg, opposite Warrenton, Mississippi, to the head of the passes; the Atchafalaya River; and the Red River to Alexandria, conceded as the upstream limit of the effect of the Mississippi River backwater, thirty-eight miles of levee rebuilding is, at the moment of writing, under actual construction. This is not emergency work; it is part of the far-sighted plan of preventive diking, against future high water.



Dumping on the fly. At left, close-up view of material may be seen as it drops from the bucket. At right, note that first cast of land slope is in place and the river side is being built up. Another trip will provide the material between and the levee crown. In the background as far as the eye can see stretches the rich farm lands which these levees will protect.

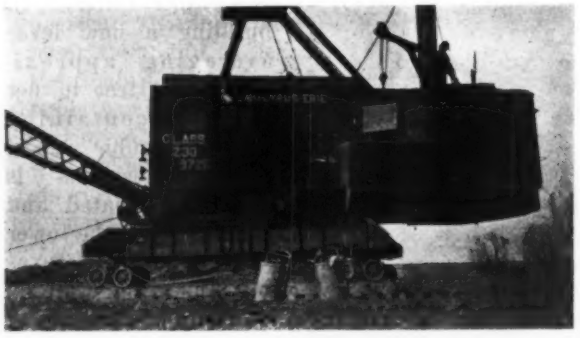
Two Levees Require 2,350,000 Cubic Yards

To Lewis-Chambers Construction Co., Inc., a New Orleans firm, there were awarded, under competitive bidding, two jobs, known as the Upper New Texas, and the Upper Morganza, levees. The former extends for approximately 1.3 miles, the latter 2 miles, making a total of 3.3 miles. The upper New Texas levee is situated on the right descending bank of the Mississippi River in Pointe Coupee Parish, Louisiana, and extends from a prominent angle directly opposite Raccourci Light, station 1271.65, downstream to a junction with the upper end of the New Texas levee, now under construction, station 1341.75, a total of 70 stations. The work consists in building a new levee averaging approximately 28 feet in net height, containing 1,050,000 cubic yards. Upper Morganza is similarly situated, and extends from the lower end of the New Texas levee, station 1395.85, down past the town of Morganza, a distance of 10,608 feet, to a junction with Lower Morganza as station 1501.80. This levee is 26 feet in average height, and contains approximately 1,300,000 cubic yards. Geo-

One of Lewis-Chambers' Class-230's at work on the St. Elmo levee.

graphically, if you wish to locate these on the map, they are near the junction of the Mississippi and the Atchafalaya Rivers, about 150 miles from New Orleans.

These two levees are among the most important in the entire district. The Morganza crevasse, one of the historic breaks, was open from 1882 to 1891.

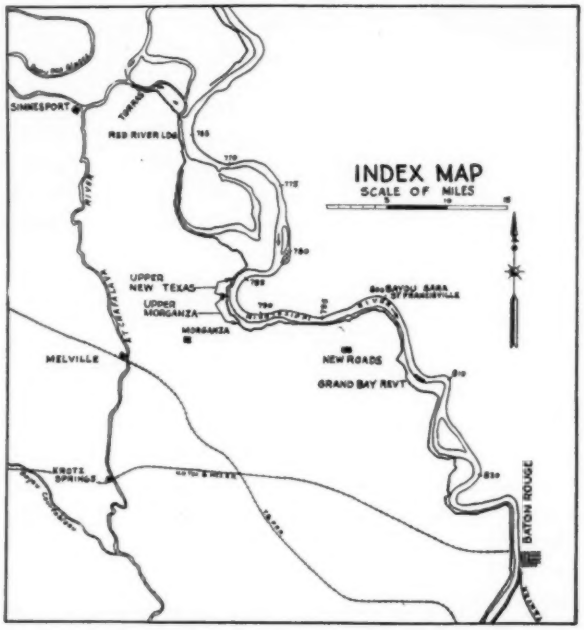


Coaling up is handled by a hoist on the machine.

Since that time, the Morganza region has been a safety gauge, recognized as one of the critical points on the river. In times of high water, those concerned with river control and the safety of the lower valley, have been interested to know how the Morganza levee was holding out. A break in the levee at this point would flood a large area, approximately 2500 square miles, which otherwise would not be inundated.

Record Time Being Made Despite Difficulties

Work on the Upper Morganza and the Upper New Texas levees was started in the middle of January of this year; under normal working conditions it will probably be completed in the latter part of 1931. The problems with which the contractors are faced are typical of levee building in the lower valley. On certain parts of the work, poor drainage, buckshot* material, and a great number of stumps — the remainder of a cypress forest once located at this point—complicated the excavating problem. But the firm of Lewis-Chambers Construction Company, Inc., of which J. H. Lewis is president and J. T. Chambers, vice-president, is making record time and progress, despite the fact that this is considered a difficult engineering project. Both are Tulane University men, holding engineering degrees, with years of practical contracting experience. Mr. Lewis is recognized as one of the foremost levee builders on the lower river, having had over twenty years' experience as a government engineer, and later as a levee contractor.



Map showing location of the Upper New Texas and Upper Morganza levees about 150 miles northwest of New Orleans.

Previous levee contracts completed by Lewis-Chambers Construction Company included the

**Buckshot:* The levee builders' term for a black, heavy mixture of clay and fine sand that dries into hard clods, but when wet is soft and sticky with a tendency to slough and slide.

Margaret Levee (600,000 cubic yards), the Willow Grove Levee (500,000 cubic yards), Willow Grove Emergency Loop (50,000 cubic yards), Willow Grove Pit (110,000 cubic yards), St. Elmo Levee (250,000 cubic yards), and the Waguespack (160,000 cubic yards).

Looking back over the 230's tracks along the line of new levee after the first operation. At the right is the borrow pit after the first cut. At the left — material in place in new levee section.

The Morganza and Upper New Texas levees are typical of this sort of work. They average from 23 to 29 feet in height, and in places have a maximum width of 290 feet. Levee construction is not blueprinted in cross section form, because of its simplicity. The equivalent of this information is written into government specifications. Levee work for this section is divided into two sections: "A" for material containing 75% or more buckshot, and "B" for loam. For both "A" and "B," a crown of ten feet is required; the riverside slope for "A" is 1 to 3 and the landside slope contains a seepage line of 1 to 6. For the "B" section, the riverside slope is 1 to 3½ and the landside 1 to 6½. These figures are not arbitrary, but approximate. The Morganza and Upper New Texas levees have a ten-foot crown, and slopes 1 to 3½ river side, and 1 to 6 for the land side.

Bucyrus-Erie Class-230 Steam Draglines, Specially Developed for This Type of Work, Giving Excellent Service, Say Owners

Borrow pits furnish the material and are located on the river side. A 1 to 10 slope is specified with maximum depth at 18 feet. A 40-foot berm must be left between levee and borrow pit. Three or four runs are required to complete the levee, beside a preliminary run to throw the spoil from the outer side of the borrow into a position close enough to permit casting into the levee. Before dirt for the levee is placed a search ditch or core

Looking across the borrow at the Class-230 with its 150-foot boom and 6-yard bucket. This machine is especially capable in this type of work because it has been designed and built to operate on soft ground, such as is frequently encountered in river training works, drainage and irrigation.

Moving Up.

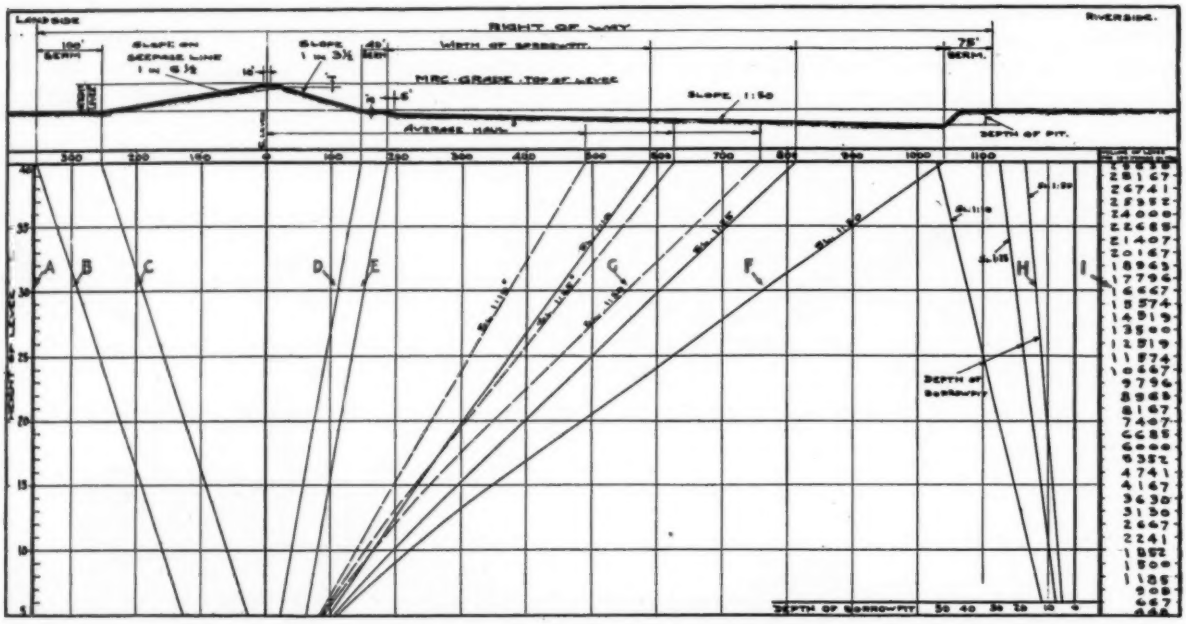
trench is dug by hand to establish a suitable bond between levee and ground surface.

Two Class-230 Bucyrus-Erie steam draglines, equipped with 150-foot booms and 6-cubic-yard buckets mounted on trucks of improved design, are in use. R. J. Phillippe is superintendent in charge of one machine and A. H. Milan of the other. Operators Harry Porche, Milton Porche and V. J. Breaux handle the levers of the former machine while the latter is operated by Ford Robillond, Louis Goode and Henry Ratchke. Three 8-hour shifts are worked 6 days per week.

The machines are mounted on trucks operating on track permanently mounted on mats. These mats, 12 feet long, are made of nine 8 x 10-inch timbers 12 feet long, with 12 x 14-inch stringers 15 feet long mounted lengthwise, armoured with three-fourths-inch thick iron plate 14 inches wide on which is carried the 100-pound steel rail sections. These 15-foot mats are swung ahead by the dragline as needed. Moving up requires 1½ to 2 hours per day. Taking coal which is hauled in by wagons takes about 45 minutes per day; the coal being handled in skips from the ground with a power hoist on the machine. Water for the boilers is supplied by pumps drawing it from the river.

In building the levees one of the Class-230's travels along approximately the center of the borrow pit, digging out the river side of the borrow

(Continued on page 386.)



In general there are three classes of levees approved for Mississippi Flood Control Work, being known by the letters "A," "B" and "C." The specifications are:

Section	Crown (Feet)	Floodway Slope	Landside Slope to Contain Seepage Line of	Governing Material
A	10	1 on 3	1 on 6	75% or more buckshot
B	10	1 on 3½	1 on 6½	Loam
C	12	1 on 5	1 on 8	75% or more of sand

The slopes may vary slightly according to the need of the locality. Specifications for levee construction state the class of levee to be constructed, the slopes, (usually as given above), and the dimensions of the borrow pit. Borrow pit specifications usually include the maximum depth, slope, and the limit of right-of-way.

A typical levee cross section of Class B levee construction is shown above, together with a useful chart prepared by Bucyrus-Erie Company engineers. This chart permits the ready calculations for any height of levee, of the length from levee center line to the land and river side toes, width and depth of borrow pit, average haul and volume of levee per 100-foot station in yards. The following is an example of reading chart: A — Height of levee 30 feet; B — Landside edge of right-of-way — 288 feet from center line; C — Landside toe of levee — 188 feet from center line; D — Riverside toe of levee — 110 feet from center line; E — Edge of berm — riverside — 150 feet from center line; F — River side end of borrow pit (1 to 50 slope) 760 feet from center line; G — *Average haul from center line — 556 feet; H — Depth of borrow pit (figure shown at bottom) — 14 feet; I — Yardage per 100-foot Station — 16,667.

Following the above, the dimensions for any Class B levee of from 5 to 40 feet in height can be calculated. Similar charts for Class A and Class C levee sections can be obtained by writing Bucyrus-Erie Company.

*Average haul is the distance from the center of gravity of the levee to that of the borrow pit. The dash lines show this distance measured from the center line of the levee.

Opening Up the Big-Slough Drainage System

Fred Wills spends winter cleaning out and deepening ditches near Geneseo, Illinois.

STARTING October 24th and finishing up April 8th, Contractor Fred H. Wills of Plainville, Indiana, and Geneseo, Illinois, worked right through the winter on his Big-Slough Drainage District job near Geneseo. The job was a 219,000-cubic-yard subcontract from his brother's outfit, The Wills Construction Company of St. Louis.

The Big-Slough Ditch cuts over the divide and runs both ways — about 21 miles — into the Rock and Green Rivers. With its laterals and their connecting tile it drains a large area of bottom land, producing corn, wheat and oats. The ditches run through peat and sand, and on the Fred Wills' portion of the contract the grade line ran in heavy sand entirely. Some of the job ran as high as 750 yards to the station, and the average for the entire job was 360 yards to a station. There was 8 miles of clean-out on Big-Slough Ditch, with 4½ miles on lateral No. 1, 3 miles on lateral No. 2 and 2 miles on No. 4. Lateral No. 6 with some clean-out on the main ditch (all totaling about 124,000 cubic yards) was handled by the Wills Construction Company with their gasoline dragline. Russell Wills and Kendall Wills were in charge of this work.

If you know Fred, you'll know he had a Bucyrus-Erie on his end of the job — his E-2 Diesel dragline swinging a 1½-yard Page bucket.

Two Miles of Ditch in Seven Shifts

The E-2 did a nice job of digging, too, and on the wind-up operators Fred Bechtal and Geo. Feaster took the wraps off her and put her through two miles of ditch in seven shifts, making a record for the job in both distance covered and yardage moved in that length of time.

Operator Fred Bechtal

Asked whether they had any trouble getting the Diesel started in the cold, winter weather, Fred laughed and replied: "No, we didn't, but I really can't offer much evidence on cold weather starting. You see we only let her get cold once or twice. Kept her going steadily all winter night and day, and only lost a couple of shifts — those on account of extremely cold weather." Fred's idea of the best way a contractor can make money is summed up in "steady going."

"Steady Going," the Wills' Watchword

"These boys who are trying to get a big day's output don't see far enough ahead," says Mr. Wills. "Big months are what bring in the profits."

Fred Wills looks her over. The job is all cleaned up, and the E-2 moved out on the hard road before the April rains set in — ready for a quick move to the next one.

The E-2 operators working two twelve-hour shifts a day kept this "steady going" in mind all through the winter, and the machine never stopped except when the thermometer dropped so low that the little coal stove in the dragline house could no longer keep hands and feet warm enough to handle the levers. The coldest shift worked started out at 22 degrees below in the morning and wound up at 28 degrees below when the night shift came on duty. Mr. Wills, who each Saturday handled the machine for one shift to permit the crews to change shifts, was at the levers himself. He suggested that the night gang call it a day and plow back through the snow drifts to town. They insisted on taking a whirl at it, however, before going in and managed to keep half warm at least for an hour or so and then gave it up as a bad job.

For lights Mr. Wills picked up a used generator at a bargain, hooked it to the flywheel of the Diesel, and so far it has given very satisfactory

service. He also has an automobile trouble lamp with an extra long cord and a 6-volt storage battery on the machine for emergency service, in case there should be trouble with either the lighting outfit or the engine.

Rear Platform Handy for This Type of Work

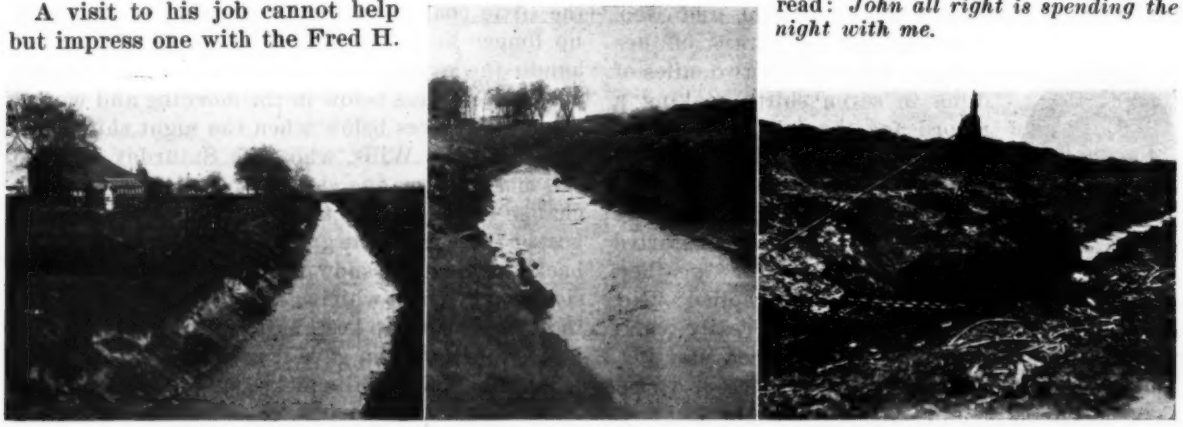
Another most convenient device used by Mr. Wills is a rear platform across the back of the E-2 connected with the side running boards by extension walks. This makes a very handy place to carry tools, grease, oil, etc. A few planks and a couple of simple iron braces for brackets puts this carry-all in place at a cost of only a few dollars, and for this type of work where clearances are not important it certainly is a worth-while investment.

Diesel Has Many Advantages

The principal advantage of the Diesel, according to Mr. Wills, is the better lugging power characteristic of this type of engine. As he tells it, "Pulling out the 1½-yard bucket heavily loaded with wet sand and breaking it away from the water suction takes considerable more power than most people would think. You can yank it out with a gas rig, but the yanking puts a strain on the machine that's bound to tell in the end. With the Diesel you have an easier, steadier pull that gets there just as fast, but doesn't make the machine suffer for it."

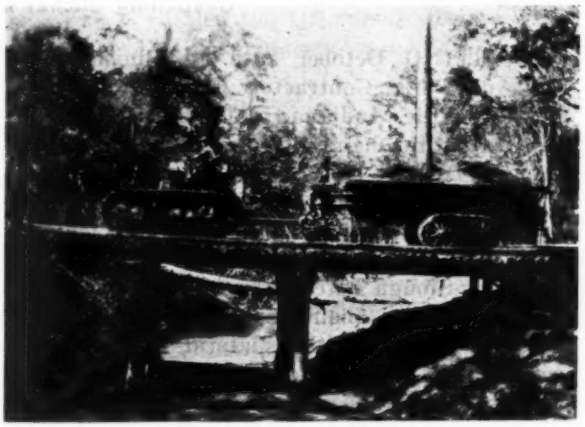
Convenience in handling a smaller volume of fuel, fuel economy, and no necessity of protecting fuel against theft, were other advantages mentioned. The E-2 averaged approximately 30 gallons of fuel oil per 12-hour shift for the job. Delivered to the Wills' truck in barrels at Geneseo this cost 8 cents a gallon. Several cents could be cut from this price had the job been large enough or long enough to have justified installing a storage tank and buying in tank car lots. Lubricating oil used ran about one and one-half gallons per 12 hours of operation.

A visit to his job cannot help but impress one with the Fred H. Wills organization. Mr. Wills picks his men well, and obtains a loyalty from them that many contractors might well envy. Equipment is well cared for, and things run along smoothly with everyone up on his toes to bring the monthly estimate up to the highest possible figure.



Here's the type of digging Mr. Wills encountered in opening up the Big-Slough district.

Specht & O'Neil, It Should Have Been



A heaped Caterpillar-drawn 7-yard Western crossing well-constructed temporary bridge on Texas road-building job of Specht and O'Neil.

Regretably we spelled Mr. Specht's name incorrectly in our article on the Texas road-building operations of this enterprising organization, which appeared in the June issue of *The Excavating Engineer*. We hope Mr. Specht and our readers will pardon our error.

Friends Indeed

A man and his wife had been married a very short time when the husband had to take a motor trip. But he promised he would be home by supper time. At seven o'clock he had not arrived. The hours dragged on till finally at ten o'clock the frantic wife sent a telegram to a friend of his in each of the several towns through which he should have passed: *John missing much worried have you seen anything of him?*

Her husband reached home a short time later and soon, also, the telegrams began to arrive. They all read: *John all right is spending the night with me.*

Improving Lackawanna Trail Through Delaware Water Gap

Continental Contracting Company meets difficult problems successfully.

THE Continental Contracting Company of Baltimore, Maryland, and Harrisburg, Pennsylvania, pioneers in the road-building game, recently completed work on their road job at Delaware Water Gap, Pennsylvania. This job, including 86,000 cubic yards of excavation, is five miles in length, with a grade width of 36 feet through the town and twenty feet the remainder of the way, approximately 4½ miles. It improves a section of the famous Lackawanna Trail that runs through the northeastern part of Pennsylvania and through the gap in the mountains made by the Delaware River.

A Tough Problem for the Powder Monkeys

This road runs along a cliff about four hundred feet above the Delaware River and the Delaware, Lackawanna & Western Railroad tracks. The old road was very narrow, and the rock on the high side had to be blasted away so that the necessary width could be obtained to make the new concrete road. There were other difficulties along the way, such as numerous hotel properties and a huge brick smokestack close by that could not be damaged. Below were the railroad tracks which had to be kept open along with telephone and telegraph wires. With all these properties to be protected, it will be realized that extreme care had to be used in blasting.

Here are two views showing the way the rock was drilled for shooting. Lots of hole was necessary, because big shots could not be used. Two Gardner - Denvers pump the air.

Loading into Autocar trucks, the Gas + Air stepped right along in this tough going.

Some of the cliff that was removed was about 75 feet in height and about 50 feet from the railroad.

The Continental Contracting Company's equipment on this job included a new Bucyrus-Erie one-cubic-yard Gas + Air shovel and a Buffalo Springfield 10-ton Roller that were exhibited at the recent Road Show at Atlantic City. Also a new Thew gasoline shovel, known as Lorain 75-B, 1¼-cubic-yard capacity; one Type-O Thew gasoline shovel, ¾-cubic-yard capacity, two 360-foot Gardner Denver Compres-

Changing the Detachable bits.

(Continued on page 341.)

FIELD NOTES

Placing the Detonator to Get the Best Results

By PAUL F. LEWIS,
E. I. du Pont de Nemours & Company, Inc.

The question of where to place the detonator in a charge of explosives in order to get the best results is one on which there has been discussion, but little agreement among lay blasters. Yet when we understand the fundamental principles involved and follow them out to their logical conclusion, we can not help arriving at an answer which is both reasonable and borne out by actual results in blasting.

The purpose of a detonator is to create a shock or concussion of sufficient strength to detonate the explosive in a charge. In considering the best position for the detonator in order to accomplish this purpose, there are two principal questions to study:

First, in what direction does a detonator exert its greatest force?

Second, in what direction has the explosive charge the most work to do, or in what direction do we wish it to exert its greatest force?

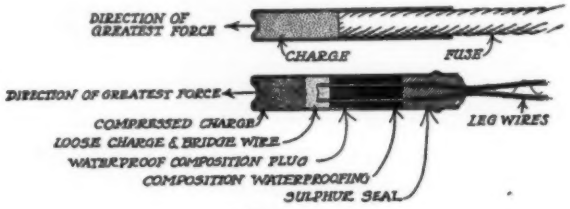


Figure 1.

The first question is best answered by examination of Figure 1, which shows:

First, that the length of the column of explosive in a detonator is nearly three times as great as its diameter, and

Second, that the line of least resistance is away from the plug, waterproofing and seal in the electric detonator and from the fuse in the ordinary detonator.

It is evident then that a detonator exerts its greatest force straight away from its charged end in a line with its long axis. The next point to consider, therefore, is what effect this characteristic of a detonator's action has upon an explosive in which it is embedded. Experimentation in the laboratory has shown that it has this effect: The explosion of the detonator starts a wave of detonation in the explosive which reaches its maximum velocity somewhere within a distance of approximately twelve inches from the charged end of the detonator, and which develops an ever-increasing volume of gases with maximum pressure at the end of the charge. Consequently it follows that the best place for a detonator in relation to a charge of explosives is with its charged end pointing in the direction in which it is desired to have the explosive exert its greatest force.

This brings us to our second question, in what direction has the explosive charge the most work to do, or in what direction do we wish it to exert its greatest force?

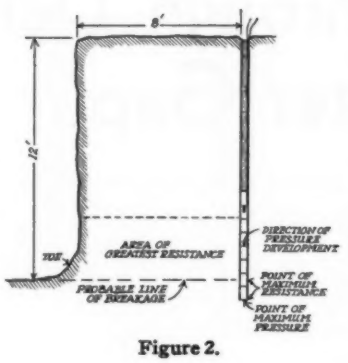


Figure 2.

To answer this, let us consider some typical problems in blasting. Figure 2 represents a 12-foot quarry bench in which we have a single row of 3-inch holes 13 feet deep, 10 feet apart, and having a burden at the toe of say 8 feet. Suppose the rock is limestone, which averages 12 cubic feet per ton, and that it is charged on the basis of 4 tons of rock per pound of explosive. Then the charge per hole can be calculated according to the following formula:

$$\text{Charge in pounds} = \frac{\text{Depth} \times \text{Burden} \times \text{Average Spacing}}{\text{No. of Cubic Feet per Ton} \times \text{Ratio of Tons of Rock per Pound of Dynamite}}$$

$$\frac{13 \times 8 \times 10}{12 \times 4} = 21.85$$

It is known that when gelatin dynamite is well tamped, it requires 4.17 pounds of dynamite to fill 1 foot of a 3-inch hole. Therefore, a charge of 21.85 pounds would fill 5.24 feet of the hole in Figure 2, leaving 7.76 feet for stemming. The area of greatest resistance in such a shot would be in the lower fourth of the burden. Therefore it is toward this lower fourth that we should direct the maximum force of the explosion. This is best accomplished by placing the detonator as near the top of the charge as safety in tamping permits and with its business end pointing toward the bulk of the charge and the bottom of the bore hole, taking care to see that the long axis of the detonator is parallel with the long axis of the dynamite column and as nearly in its center as possible.

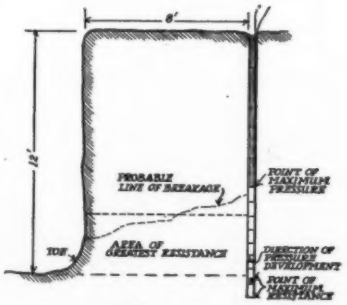
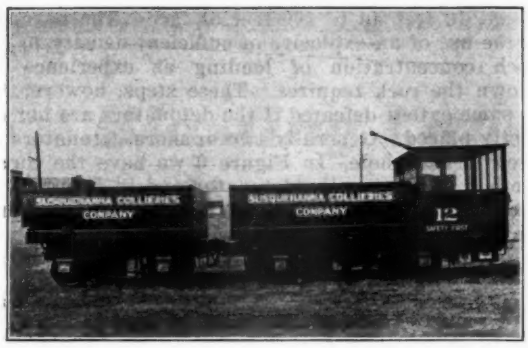
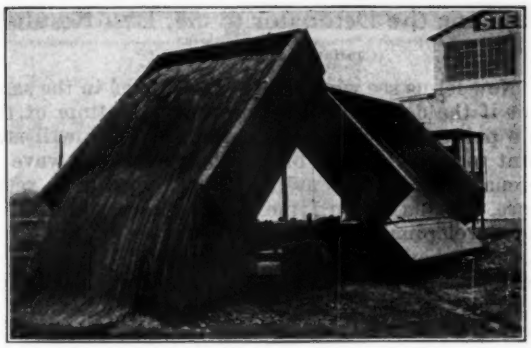


Figure 3.

With the detonator in this position, the maximum pressure of the gases from the explosive, which we have stated above is built up cumulatively until the wave of detonation reaches the end of the charge, will be exerted at the bottom of the hole. When it there strikes the immovable solid behind and below it, it will be deflected toward the face, pushing the rock forward with a shearing action along the line of least resistance, which is the floor line, pulling bottom, that is, and shattering the mass through the speed of its impact.

(Continued on page 338.)





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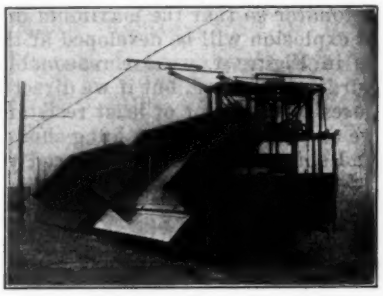
Carry a load on the locomotive— Differential Locomotives carry a pay-load instead of ballast. The photograph at the right shows a Differential Locomotive (electric) rated at 100 tons loaded and 50 tons light. Differential Locomotives are furnished in straight electric, gasoline, Diesel, or gas electric types. Various sizes in each type. Send for illustrated bulletins.



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Placing the Detonator to Get Best Results

(Continued from page 336.)

Now let us see what is likely to happen in the same shot if the detonator is placed in the bottom of the hole pointing upward, as in Figure 3. It will still point toward the bulk of the charge but the wave of detonation will start at the point of maximum resistance, moving toward the point of least resistance and developing the maximum pressure of the gases 5.24 feet above the bottom of the hole. The probable result would be some such line of breakage as indicated in the figure, leaving a solid toe, especially if there is no natural parting at the quarry floor. It is not intended to convey the idea that no work is done until the maximum pressure is reached, for the rate of detonation of even the slowest dynamite is so high that some disruptive pressure is exerted from the very start of the wave of detonation. But it is true that the greatest pressure is not exerted at the point of greatest resistance, and does not have the same chance as in Figure 2 to shear the rock from the rear, bottom and sides.

Of course, the same result as shown in Figure 3 is likely to occur also with the detonator pointing toward the bottom of the hole if the face has a very heavy toe, for the pressure of the gases would then simply back up in the hole until it finds a place where it can push out the stone.

Let us next apply the same principles to a snake hole blast. Assuming that springing is not required, the point of greatest resistance is at the back of the hole. If we charge the hole properly and point the detonator so that the maximum pressure of the gases of explosion will be developed at the back of the hole, as in Figure 4, we are reasonably sure to pull the burden as desired, but if we direct the pressure of the gases to the point of least resistance, as in Figure 5, we are likely to have a hung shot or to leave a "gun" and obtain a materially reduced yield.

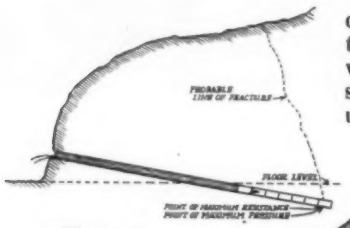


Figure 4.

The same principle applies likewise to well drill blasting when detonators instead of cordeau are used. Quarrymen are generally agreed that if the toe is brought out the blast is at least seventy-five per cent successful, the other twenty-five per cent being a matter of breakage. As the toe of the shot is where the most work is to be done it follows again that that is where the maximum pressure should be exerted. The first step toward massing pressure on the toe consists in drilling the hole below the floor level to create dynamite space at the strategic point. The general rule is to drill about 1 foot below grade for each 10 feet of face height for faces up to 50 feet, and 6 inches additional for each additional 10 feet up to 100 feet of face. The next step is the use of an explosive of sufficient density to give such concentration of loading as experience has shown the rock requires. These steps, however, are to some extent defeated if the detonators are not correctly placed. Generally two or more detonators are used in each hole. In Figure 6 we have the correct method of placing the detonator and in Figure 7 the incorrect method. In the latter case we have three waves of detonation — the two principal waves meeting and the greatest pressure being exerted at the top of the *area* of greatest resistance and well above the *point* of greatest resistance, with the probable result of leaving the toe solid. On the other hand, with both detonators pointing toward the bottom of the hole, the entire pressure develops cumulatively toward the bottom of the hole where it is needed in order to pull the bottom of the burden.

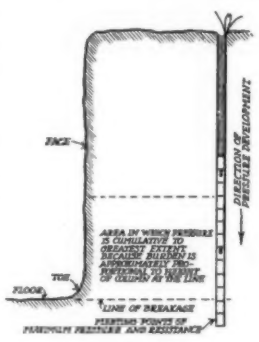

FACE
DIRECTION OF PRESSURE DEVELOPMENT
AREA IN WHICH PRESSURE IS CUMULATIVE TO GREATEST EXTENT, BECAUSE BURDEN IS APPROXIMATELY PROPORTIONAL TO WIDTH OF CHARGE AT THE LINE
TOE
FLOOR
LINE OF BREAKAGE
POINTS POINTS OF MAXIMUM PRESSURE AND RESISTANCE

Figure 6.

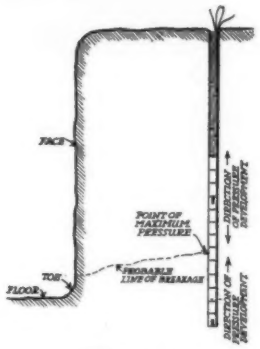


Figure 7.

Wherever the detonator is placed, observance of the following simple rules is also necessary in order to secure good results:

1. In priming a cartridge with an electric detonator avoid kinks and half hitches in the leg wires, as these often result in bare and broken wires and short circuits.

2. In making primers with cap and fuse, do not lace the fuse through the cartridge as that results in sharp bends which may break the powder train, thus leading to a misfire or hangfire, or may cause the fuse to spit from the side and ignite the charge.

3. When using safety fuse, keep it dry, don't kink it, cut the end to be put in the detonator off square, and when the time comes to fire the shot be sure the fuse is lighted.

4. Use only wooden tamping sticks, in order to avoid injury to wire insulation or fuse.

5. Use only well-insulated firing cable and keep it dry.

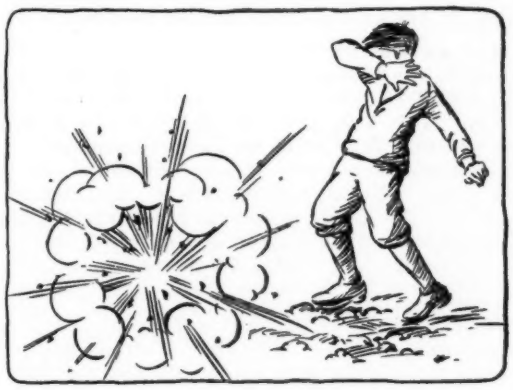
6. Use only a source of firing current which is reliable and ample, and test it frequently, by means of a rheostat and two electric squibs if a multiple shot device, or by means of one or more electric squibs alone if a single shot device.

7. Prevent high resistance in the circuit by scraping wire ends clean and making all joints tight.

8. Test all multiple shot circuits with a circuit tester to insure against failures from high resistance or broken wires.

Blasting Caps Cause Needless Suffering for Many Children

MINERS, quarrymen and other users of explosives do your share to prevent children from being injured by playing with blasting caps. The average man does not want to harm a child.



Yet, thoughtlessness or carelessness on the part of men who handle explosives is indirectly responsible for practically all the blasting cap accidents which annually injure—and, in some cases, kill—several hundred children.

Almost wholly, the accidents are due to the fact that the users of blasting caps neglect to put these articles in safe places where they cannot get in the hands of children, or because the caps are lost where children find them.

Too often the boy who picks up a blasting cap throws it into a bonfire, strikes it with a hammer or a rock, or uses a pin, a nail or a bit of wire to penetrate the highly sensitive fulminate of mercury—an extremely powerful explosive—with which the copper shell is loaded.

Again, this year, blasting caps will cause needless suffering for hundreds of children. Fingers will be blown off, hands and arms will be made useless, one or both eyes will be destroyed, faces will be disfigured for life, and some of the children will lose their lives.

How many will suffer or be killed depends on the number of blasting caps children find. Do not be among the thoughtless and careless. Do everything you can to keep blasting caps from getting into the hands of your children or the children of others.

HOW YOU CAN HELP PROTECT CHILDREN

Blasting cap manufacturers and the Institute of Makers of Explosives are making every possible effort to have users of caps keep them locked in magazines or especially designed detonator boxes; to avoid carrying caps in the pockets of clothing; to make sure that no caps are left lying about mines or other workings, and otherwise to keep caps out of the hands of children.

Please take every possible precaution to prevent any child from getting a blasting cap

Institute of Makers of Explosives

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The Business Situation

IT is unquestionably true that business of the immediate future depends largely upon group psychology or the mental attitude of those engaged in business. In other words the short-term trends — those trends that change rapidly — are governed in a very large measure by either pessimism or optimism among men engaged in industry.

The long-term trends, however, rest on a much deeper foundation. These long, steady swings of business activity which do not vary from day to day or from week to week, but rather obtain for several years at a time, are governed by fundamental conditions — economic situations in this country and abroad.

Let us take a look at these fundamental conditions, intentionally casting aside the feeling of pessimism that has taken hold of so many minds in the past few months. Experience has taught us that business runs in cycles and experience has taught us that these cycles are governed by fundamental conditions which, in the past few years, the American business man has been studying with increasing care.

Last summer, over-speculation, tightness of money and over-production led definitely to a period of recession. At the present moment there is an abundant supply of money at low rates. There is some evidence that current production of goods is running behind current consumption. Crops are progressing very satisfactorily, very small inventories are being held by industries. All of these factors point to an up-swing. We have now had almost a year of receding business activity. Judging by other recessions it is about time for the up-swing to start.

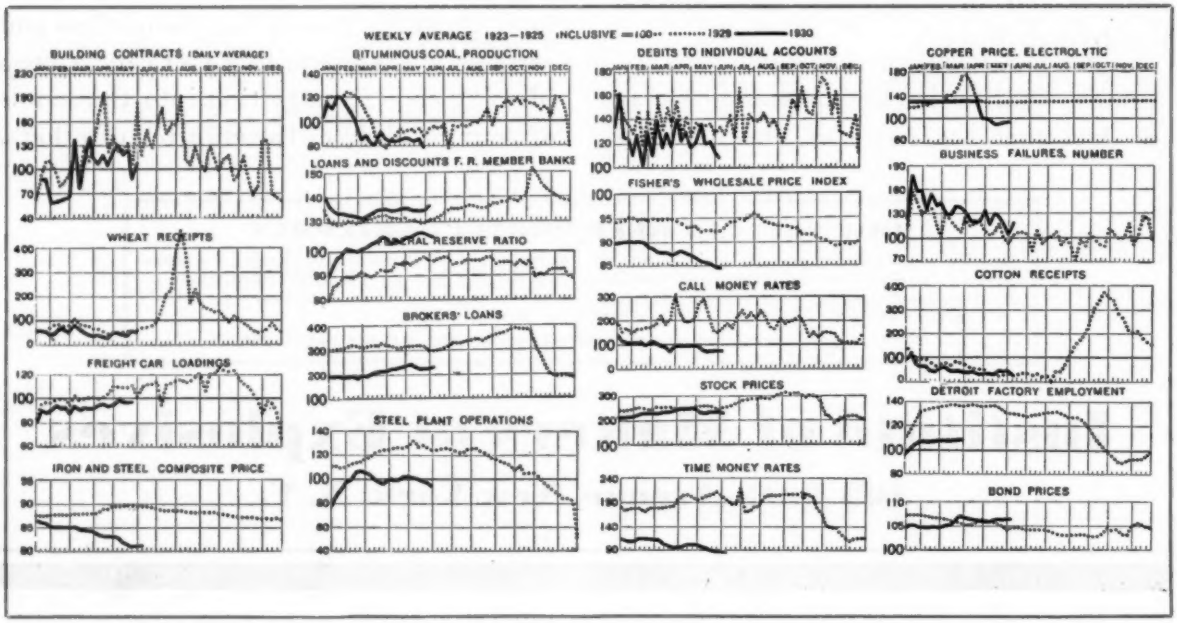
This is rather hard to really believe, when all your associates are in the dumps, but isn't it natural to feel pretty low after such a period of poor business?

The man who is today guided solely by careful thought has a reason to feel optimistic; he who is guided by his feelings may well be pessimistic.

May awards for new building and engineering projects in the 37 states east of the Rocky Mountains, totaled $457,416,000 according to F. W. Dodge Corporation. This was a decline of 5 per cent from the total of $482,876,700 for the preceding month. The past month's record was 22 per cent below the May 1929 total of $587,765,900. For the first five months of the year construction contracts totaled $2,037,439,900. This was a decline of 18 per cent from the total of $2,485,655,700 for the corresponding period of 1929.

For the fifth consecutive month public works and utilities were the most important of all classes. This group totaled $134,913,100, or 29 per cent of all awards in May. Residential building amounted to $116,568,500, or 25 per cent of the total; contracts for commercial buildings amounted to $73,340,200, or 16 per cent; and industrial structures totaled

WEEKLY BUSINESS INDICATORS



$54,566,400, or 12 per cent. All other classes of non-residential buildings were 18 per cent of the May total.

Contemplated new work of all kinds reported in May amounted to $643,405,900, compared with $954,618,300 for the previous month and $847,156,600 for May 1929.

The 5 per cent decline of May 1930 from April 1930 may well be compared with the same two months of last year when, it will be remembered, that a much more drastic decline occurred. May 1929 was much behind April 1929, while June and July of last year were very good months.

Light Cuts Graded with Bulldozers

Salmon Brothers, Inc. of Netcong, New Jersey, are grading and paving seven and one-half miles of concrete highway between Culver's Lake and Hainesville, New Jersey State Highway, Route S-31, Section No. 1 and hope to finish the job in the fall of 1930. For excavating the 300,000 cubic yards required they are

Grading light cuts with bulldozing Caterpillar. In the background a Bucyrus-Erie is opening up a heavier cut.

using four Bucyrus-Erie shovels, twelve Mack and White trucks and two Caterpillar Sixtys equipped with bulldozers.

One of the latter is used, as shown in the illustration, to skim off the top soil in preparation for laying the grade for paving when only a light cut is necessary. The bulldozer had little trouble in picking up this top soil and pushing it to the side of the right-of-way, which proved the method to be an economical one. The other bulldozer is being used to level the earth as it is dumped by the trucks on the fills.

Improving Lackawanna Trail Through Delaware Water Gap

(Continued from page 335.)

sors, one 110-foot Ingersoll-Rand Compressor, 60 and 30 Caterpillar tractors, La Plant Bulldozers and wagons, and eight Autocar trucks.

New Detachable Bits Successfully Used

The drilling was done with the Gardner-Denver hand hammers, using steel and detachable bits furnished by the Detachable Bit Corporation of America. These bits averaged about 5½ feet per bit in this hard work. The detachable bit eliminates sharpening and cuts the cost of handling the steel on the job. Its use on this operation proved very satisfactory. 60% Trojan powder was used and very good results have been obtained in the blasting, the rock breaking so that good yardage could be obtained with shovels.

Excellent progress was made at the start in February, considering the handicaps and the weather.

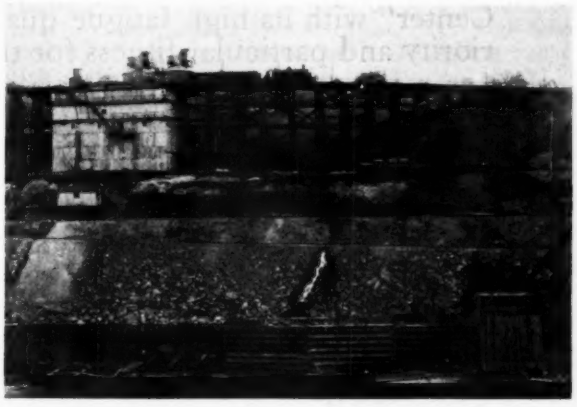
The Continental Contracting Company expected to have most of the grading and all the concrete laid through the town before the vacationists arrive at the Water Gap this summer.

On the job Frank Byron, Vice-President, was in charge of field operations, assisted by John Steinberger. "Honus" Wagner had charge of the field office.

New England Harnesses Fifteen-Mile Falls

(Continued from page 328.)

Fraser-Brace Engineering Company, Inc., are personally supervising the construction. L. V. Branch is Resident Manager and R. B. Norris is Superintendent of Construction for the Connecticut River Development Company. Engineering designs are furnished by the New England Power



Concrete plant.

Construction Company of 89 Broad Street, Boston; H. T. Pierce is chief engineer, with Albert S. Crane of New York and Chas. T. Main, Inc. of Boston as the consulting engineers.

Even now, without the important Fifteen-Mile Falls addition, the New England Power Association directly, and through its sales of power to local distributing companies, supplies light and power to more than 250 communities scattered over the five New England states of New Hampshire, Vermont, Rhode Island, Massachusetts and Connecticut. Seventeen companies constitute the principal membership of this vast electrical network.

ROEBLING

"Blue Center" Steel Wire Rope

Roebling Service

does not end with the sale of wire rope, but includes co-operation with the rope user to obtain the best results in service.

Roebling "Blue Center" Steel Wire Rope, because of its superior quality, has longer life in service and greater working capacity than ropes of inferior material.

It is particularly adapted for use on excavating machinery where it is subjected to heavy strains, sudden jerks and pulls. "Blue Center" with its high fatigue qualities has demonstrated its superiority and particular fitness for this exacting duty.

Information regarding the proper selection of wire rope will be furnished on request.

John A. Roebling's Sons Company, Trenton, N. J. Makers of Wire Rope and Wire

In writing to John A. Roebling's Sons Co. please use post card bound in the center of this number.

EQUIPMENT YOU OUGHT TO KNOW ABOUT

New Strayer Electric Bucket

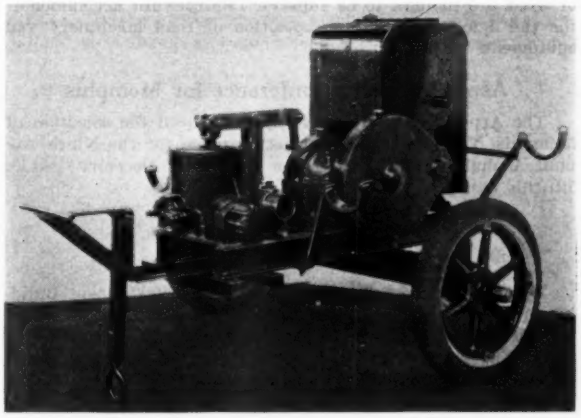
A new electric-motor-operated, power-arm-type clamshell bucket, known as the Strayer Electric, has been announced by the *Erie Steel Construction Company, Erie, Pennsylvania.* Several large manufacturers have been operating one or more of these buckets during the past year in hard digging and claim, according to the makers, that they fulfill every requirement of an industrial material handling bucket. The features and advantages claimed for this new electric bucket include: attached or detached in a minute, works within its own height, automatic feature protects the mechanism, will not open until the current is applied, fewer parts, no readjustments necessary, simplified wiring, every part standard, tested and guaranteed, not top-heavy, correctly shaped digging scoops, handles coal, coke, broken open-hearth slag, sand, stone, cement, clinkers, and like bulk materials.

The new Strayer Electric is manufactured in ¾-cubic-yard capacity and up, either AC or DC, for inside or outside work. A new Electric bulletin is ready for distribution and will be sent to anyone interested. Please mention *The Excavating Engineer* when writing.

A Pump of New Design

A new pump of entirely new principle, design and performance, known as the Roller Ring Plunger Pump, has been designed, tested and placed on the market by the *Novo Engine Company, Lansing, Michigan.* According to the manufacturers, an absolutely liquid tight water seal is maintained by two rubber rings on the plunger that roll with the action of the piston as they are pressed against the cylinder wall. The rolling action of these rings prevents friction, permitting the use of one set of rings for an entire season's work. Due to the rapidity of the strokes of the plunger, which operates at 120 strokes per minute, water is forced through the pump at very high velocity, permitting it to carry along a great deal of the foreign material held in suspension. The straight line flow from suction inlet to discharge also aids in permitting foreign matter in suspension to pass through the pump.

One of the main features, the roller ring, eliminates for those having dewatering problems, the changing of diaphrams, packing the pistons, etc., say the makers, thus eliminating many of the troubles



found in other types. The pump, weighing only 960 pounds, has a capacity of 3500 to 5000 gallons per hour and develops a 100-foot head. For high-speed hauling it may be mounted on a coil spring rubber tire trailer as shown in the illustration above. A four-wheel truck mounting is standard. For further information, address a card to the *Novo Engine Company.*

New Crawler Wheel

The new Trackson Crawler Wheel represents several notable improvements in crawler wheel construction, resulting in greater strength and resistance to wear, according to the manufacturer. They are designed to meet the heavy hauling requirements of con-

tractors, highway men, sand and gravel companies, pit and quarry operators and many others. They are built of the strongest materials — heavy alloy steel castings and drop forgings — and are well able to

(Continued on page 368.)

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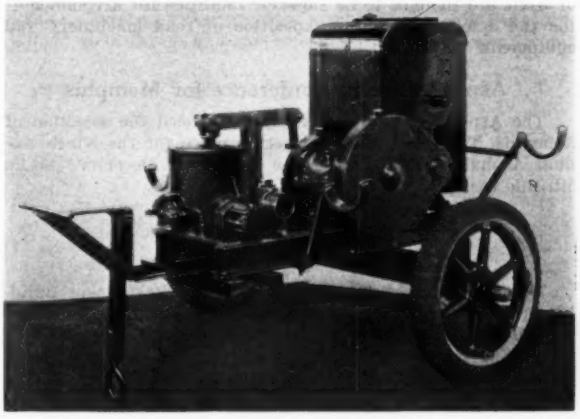

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(Continued on page 368.)

SHOTS FROM THE FIRING LINE

American Road Builders' Association Selects St. Louis

St. Louis has been chosen as the site of the 1931 convention and road show of the American Road Builders' Association. This announcement, following the annual business meeting of the Association and the installation of new officers in Washington, May 15-16, carries out the new policy of giving the annual gathering to a new section of the country each year. The Missouri metropolis was chosen over the rival bids of Houston, New Orleans, and other cities of that region, because of what are thought to be superior facilities for accommodating the delegates and the exposition of road machinery and equipment.

Asphalt Paving Conference for Memphis

The Asphalt Institute recently announced the selection of Memphis, Tennessee, as the meeting place for the Ninth Annual Asphalt Paving Conference to be held December 1st to 5th this year.

Canada

Quebec Notes

Hon. J. E. Perreault, Minister of Roads, Parliament Buildings, Quebec, Quebec, announced $11,000,000 road-construction program for 1930. Important features are: completion of five important highways into the northern sections of the province; new approaches to several Montreal bridges; widening of Montreal-Toronto highway, etc.

New England Notes

BY E. J. O'CONNOR

T. Stuart & Sons' Type 1030 drag shovel shown above, is now busy on a large gas pipe job for the Boston Consolidated Gas Co. Ray Dupuis, the operator, has averaged about 2500 lineal feet of trench a nine-hour day, the trench being about four feet deep and three feet wide. This company has recently bought another drag shovel attachment for this work. Their 41-B is also being used, equipped as a pile driver, for laying lines across the Charles River.

Amos D. Bridge's Sons have just started a three-mile road job in Temple, New Hampshire. Their new Bucyrus-Erie B-2 steamer is being used on this job.

The Central Construction Co., Lawrence, Massachusetts, was awarded about four miles of street work in Dover, New Hampshire. Earl Eddy is running their Gas + Air for them on this work.

John Bristow, Narragansett Pier, Rhode Island, is making excellent progress on his road job in South Kingston, Rhode Island. Joe Bristow is superintendent of construction, and his brother, Dick, is running the new Gas + Air.

A. Gonnelli placed his Bucyrus-Erie B-2 in the cellar excavation of a three-story building for the Electric Protective Company in Providence, Rhode Island, and it didn't take long for this little husky to eat its way through brick-bats, earth and concrete foundations at a record rate.

So Thoughtful

Helen:: "What are you knitting, Alice?"
Alice: "Something to cheer up the boys."
Helen: "Why the war was over long ago."
Alice: "This is a bathing suit for myself, my dear."

New York Notes

BY R. K. HALL AND E. G. LEWIS

For over nine years this shovel has been battering old brick and concrete foundations, in hard and soft rock, part of the time equipped with a crane boom driving piles — and still going strong today.

The picture shows a Bucyrus-Erie Type B machine owned by **Miller, Daybill & Company,** New York contractors. It is an old photograph taken back in 1923 on a New York basement job. Among the larger jobs it has handled in late years was

one in 1927, when the machine worked 99½ eight-hour shifts, most of this time on a two-shift-per-day basis at the United States Appraisers Stores. In 1928 it worked from July 28 to November 3 at the Western Union Telephone Company building. Two months of this job were run on double shifts. The old-timer did not shut down one minute for repairs on either of these jobs. The shovel is now on a street repair job, tearing up old paving, and is still doing satisfactory work.

At the Haverstraw quarries of the **New York Trap Rock Corporation,** two powerful 3-yard Bucyrus-Erie electric shovels are used in supplying a newly installed crusher with

7,000 yards of trap rock per day. Here we see one of the 100-B's loading a Mack truck. (Note the smooth, even quarry floor and strata of the quarry face.)

New York Trap Rock Company quarries scattered throughout New York state are using twenty Bucyrus-Erie excavators, including eight 50-B's, three 100-B's, a 120-B, a 31-B, a 30-B, a Class-45 and five railroad-type shovels in the 100-ton class.

Here's **N. A. Steele's Bucyrus-Erie Gas + Air** keeping a fleet of 10 trucks "on the go" in Long Island City. The machine was hired by the Arthur A. Johnson Corporation, general contractors, to work on Route No. 108, Section No. 7, of the new subway on Queen's Boulevard.

Baltimore Notes

BY STUART M. CHRISTHILF

Harry T. Campbell Sons' Company of Towson, Maryland, has just purchased a new Bucyrus-Erie 42-B steam machine for use in their Texas, Maryland, Quarry. This machine will replace a "Type B" Bucyrus-Erie that for seven years has been moving on an average of 500 tons of stone daily. This makes the seventh Bucyrus-Erie machine the Campbell Company has purchased.

Now What, Sister?

Visitor (at private hospital): "May I see Lieutenant Jones, please?"

Matron: "We do not allow ordinary visiting. May I ask if you're a relative?"

Visitor (boldly): "Oh, yes! I'm his sister."

Matron: "Well, well! I'm very glad to meet you. I'm his mother."

Slander? Oh, My, No!

"Now, she asked, "is there any man in the audience who would let his wife be slandered and say nothing? If so, stand up."

A meek little man rose to his feet.

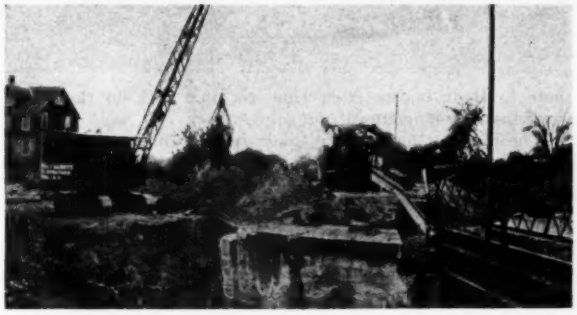
The lecturer glared at him. "Do you mean to say you would let your wife be slandered and say nothing?" she cried.

"Oh, I'm sorry," he apologized. "I thought you said slaughtered."

Buffalo and Vicinity

BY B. WHITE

Ingersoll and Barhite of Medina, New York, have found their Bucyrus-Erie Type 1030 Clamshell Crane, shown in the illustration here, a most handy, all-purpose tool. During the season of 1929 the machine worked on State Contract 8265-A, Steuben County. The machine was called upon to unload steel fabric and concrete aggregate from cars for five



and one-half miles of road and completed the job in nine weeks' working time. It was also used last season on State Contract No. 1868 in Genesee County, where it served on a multitude of jobs, such as wet channel excavation, driving piles, placing large girder beams, transporting concrete from mixer to forms, excavating old timber foundations, and so forth. The illustration shows the machine in operation on this Genesee County job.

Pennsylvania Notes

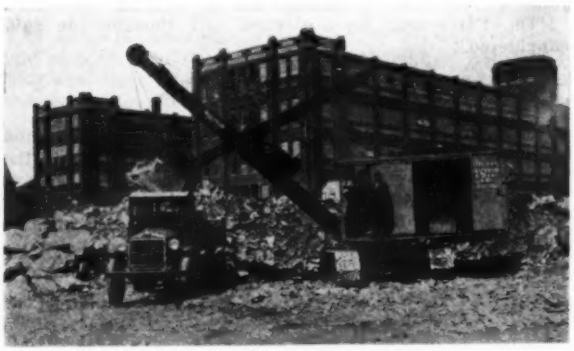
BY E. T. BROOKS AND J. F. TAIT

The Thomasville Stone and Lime Company operates one of the largest lime plants in the State of Pennsylvania. Their shovel equipment consists of five Bucyrus-Erie Type B steam machines and one Type 1030 Bucyrus-Erie gas crane. They are using four of their Type B's for loading rock and the other with the 1030 (shown below) for stripping. Their oldest Type B, installed in May, 1916, still in active service after 14 years of strenuous quarry work, is still loading 400

tons of stone per day. The Thomasville organization are great boosters for their Bucyrus-Eries and, says General Manager Johnson, "the only complaint we have to make is that we do not seem able to wear the machines out so as to replace them with more up-to-date machines." Their Type 1030 was installed in August, 1928, and to date has not lost over a half day due to mechanical trouble.

SHOTS FROM THE FIRING LINE — Continued

The Textile Machine Works, Berkshire Knitting Mills and Narrow Fabric Company are known as the Wyomissing Industries. They employ possibly 8,000 people. They build addi-



tions to their plants from time to time and do their own work instead of letting it out on contract.

The picture shows their Bucyrus-Erie Diesel + Air loading into a Sterling on a job that consisted of about 10,000 cubic yards of rock excavation. They were leveling off a vacant lot to make a parking space for their employees. White trucks were also used in moving the rock.

Their Construction Department is under the supervision of George Miller and Sam Russell. Paul Barry is the shovel engineer.

No Bones!

Girls, when they went out to swim,
Once dressed like Mother Hubbard;
Now they have a bolder whim;
They dress more like her cupboard.

Detroit Notes

Peter Mack sends us this one clipped from the Detroit Free Press: "A go-getter is a man who walks fast to save three minutes to spend watching a steam shovel."

Minnesota Notes

The Winston Brothers Company, well-known contractors, recently announced the removal of its general office to 1470 Northwestern Bank Building, Minneapolis, Minnesota.

Southern Notes

BY R. S. WELFER AND W. W. WHORLEY

J. W. Bell, Monroe, Louisiana, is operating a Class-14 dragline for the Monroe Sand and Gravel Company. He would be glad to hear from his old-time operator friends.

Millsap & Parker, Birmingham, Alabama, bidding with the **Nichols Contracting Company of Atlanta,** will build the new Birmingham airport. They expect to complete it by October 1.

W. R. Eve, Augusta, Georgia, is elevating a section of road near Cheraw, South Carolina.

John D. Twiggs, Augusta, Georgia, will make the principal fill. Mr. Twiggs recently rebuilt the levee, which broke during the record flood at Augusta last year.

South Carolina called for bids on seven million dollars' worth of grading and paving in late May.

Work continues on the Mississippi River levee system. The Vicksburg office received bids on May 16, on about fifteen million cubic yards; the New Orleans office received bids May 27, on something over six million cubic yards. Unusually low water has enabled the contractors to make an early start on work for which contracts were let last year.

Cummins Hall is stripping and loading phosphate rock with a Bucyrus-Erie Class-24 dragline for the Charleston Mining Company near Mount Pleasant, Tennessee. Elmer Chappell is keeping the boiler hot. I. E. Newman is superin-

The New
WILLIAMS
Champion - -

DEFINITELY guaranteed to dig harder materials than any bucket built. Saves dynamite—*"the Dynamite is in the Bucket."*

Write us, and we'll arrange a trial—make your own comparisons. *A real champion welcomes competition!*

G. H. WILLIAMS COMPANY
603 Haybarger Lane, Erie, Pa.
Branch Offices: New York, Pittsburgh, Chicago

21 improvements give extra Digging Power to the New WILLIAMS "Champion."

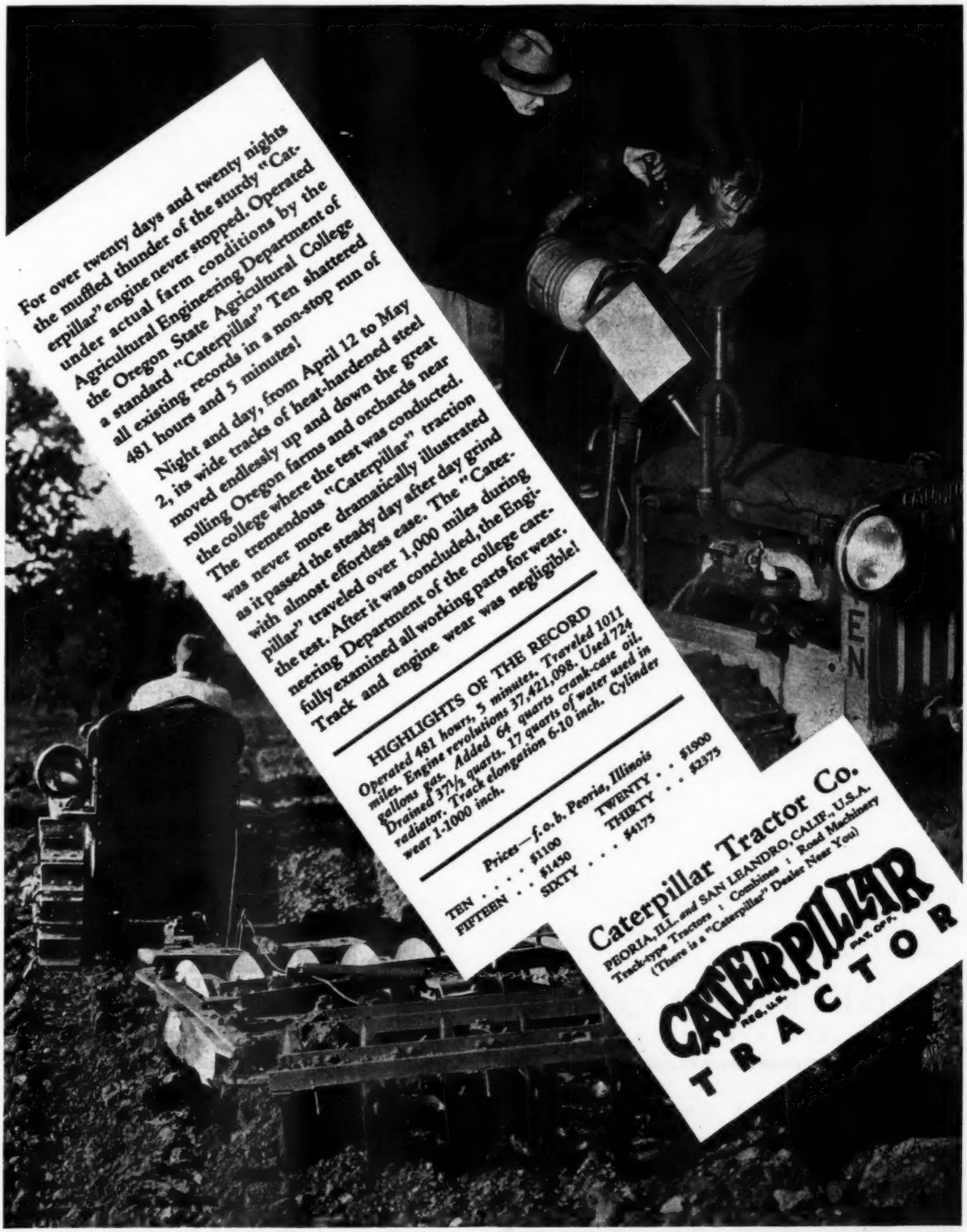
WILLIAMS
BUCKETS—TRAILERS

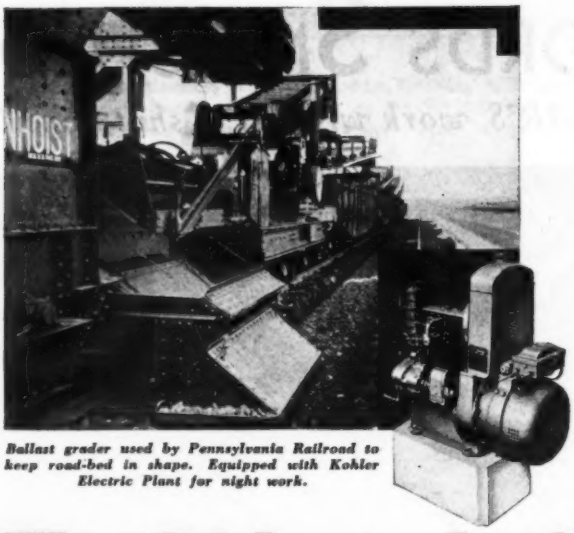
192

In writing to G. H. Williams Company please use post card bound in the center of this number.

WORLD'S RECORDS SMASHED

"Caterpillar" does an average YEAR'S work without a shut-down!


For over twenty days and twenty nights the muffled thunder of the sturdy "Caterpillar" engine never stopped. Operated under actual farm conditions by the Agricultural Engineering Department of the Oregon State Agricultural College a standard "Caterpillar" Ten shattered all existing records in a non-stop run of 481 hours and 5 minutes!
Night and day, from April 12 to May 2, its wide tracks of heat-hardened steel moved endlessly up and down the great rolling Oregon farms and orchards near the college where the test was conducted. The tremendous "Caterpillar" traction was never more dramatically illustrated as it passed the steady day after day grind with almost effortless ease. The "Caterpillar" traveled over 1,000 miles during the test. After it was concluded, the Engineering Department of the college carefully examined all working parts for wear. Track and engine wear was negligible!
HIGHLIGHTS OF THE RECORD
Operated 481 hours, 5 minutes. Traveled 1011 miles. Engine revolutions 37,421,098. Used 724 gallons gas. Added 64 quarts crank-case oil. Drained 37½ quarts. 17 quarts of water used in radiator. Track elongation 6-10 inch. Cylinder wear 1-1000 inch.
Prices—f. o. b. Peoria, Illinois
TEN $1100
FIFTEEN . . . $1450
SIXTY . . . $4175
TWENTY . . . $1900
THIRTY . . . $2375
Caterpillar Tractor Co.
PEORIA, ILL. and SAN LEANDRO, CALIF., U.S.A.
Track-type Tractors : Combines : Road Machinery
(There is a "Caterpillar" Dealer Near You)
CATERPILLAR
REG. U.S. PAT. OFF.
TRACTOR



Ballast grader used by Pennsylvania Railroad to keep road-bed in shape. Equipped with Kohler Electric Plant for night work.

The 24-hour day!

THIS ballast grader is used by the Pennsylvania Railroad to maintain road-beds over which many of the world's fastest trains run daily. Assisted by spotlights from a Kohler Electric Plant, the crew works in the night hours when traffic has slowed up.

Railroad men and construction engineers appreciate the economies made possible through efficient lighting of night work. On work trains, in mining camps, in oil-fields, *everywhere*, Kohler electricity is regularly on the job. A source of sure and steady electric current whenever and wherever needed.

Kohler Electric Plants generate current at 110 or 220 volts D. C. or A. C. They range in capacities from 800 watts to 10 K. W. Their operation is smooth and sure—as silent as a fine motor-car. All models are compact, rugged and readily transportable. They run without storage batteries. Current is turned on the moment you push any switch in the circuit. For complete information answering your specific needs, send the coupon below. Kohler Company. *Founded* 1873. Kohler, Wis.—*Shipping Point*, Sheboygan, Wis.—*Branches in principal cities.* . . . Manufacturers of Kohler Plumbing Fixtures.

KOHLER OF KOHLER

ELECTRIC PLANTS

EE—7-30

KOHLER CO., Kohler, Wisconsin

Gentlemen: Please send catalog describing Kohler Electric Plants.

*Name*_____ *Street*_____

*City*_____ *State*_____

*Use in which interested*_____

SHOTS FROM THE FIRING LINE — Continued

tendent in charge of operations in the Mount Pleasant area and Garrick Collier is foreman on the above job.

V. J. Walters writes us from Jackson, Mississippi, that he is operating an old-time, traction-wheel Bucyrus-Erie steamer.

Breland & Liles are making good headway on their highway job near Bluff City, Tennessee.

Myers & Rambo expect to be moving dirt shortly on their new job in Washington County, Tennessee.

J. T. Moses is loading brown ore for the Republic Steel Corporation near Rickey, Alabama, with a Marion 37.

No Crime

Judge: "Your wife says you have her terrorized."

Prisoner: "Honestly, your honor, I ———"

Judge: "I am not asking this in my official capacity, but as man to man, how do you do it?"

Missouri Notes

BY H. E. SNIPE

The above illustration shows **T. C. "Capt." Boyd's** Bucyrus-Erie 20-B steamer in action down in Taney County some time ago. Clifford Boyd, son of T. C. Boyd, thinks there is no dirt-moving gadget like the 20-B and is shown at the levers. Boyd and Boyd, father and son, claim the world's endurance record — 500 miles in 4 years without ever having to change a cat tread, and we certainly believe that is stepping right along.

And then there's the sailor who said "I guess we'll make port;" as he threw in another handful of raisins.

NOVO

FLUD-LITE LIGHTING UNITS

For lighting cranes—shovels—construction jobs—cheaply and dependably—compact—light in weight—with standard generator and Novo Rollr Engine. 1¼ to 25 K. W.

Please send me the special folder

Name _____

Address _____

City _____ State _____

Mail to NOVO ENGINE COMPANY

222 Porter St., Lansing, Mich.

Clarence E. Bement, *Vice-Pres. & Gen. Mgr.*

THERE'S a place for all things—and shallow grading work in cutting in subdivision streets is a place for the Haiss Excavator. These machines at work in different places, have been taking out 500 yards in 9 hours, 350 yards in an 8 hour shift, 630 yards in 8 hours, 46,340 yards in a season, etc., depending on digging conditions and the number of trucks available.

It digs without plowing — in anything that will yield to pick and shovel. *It digs continuously* — a positive nibbling action that tears out surprising yardage. *It will stand the gaff*—one recent report shows repairs @ 15/100c. per yard handled.

Going after shallow grading? Then figure costs on a Haiss Excavator basis and save money. A post card will bring a catalog.

GEORGE HAISS MANUFACTURING CO., Inc.

144th Street and Park Avenue, New York, N. Y.
Representatives in all Principal Cities

H-671

HAISS EXCAVATOR

"up to 2 cu. yds. per minute"

for

Street Grading

THE MEASURE of WIRE-ROPE QUALITY IS THE SERVICE IT HAS RENDERED

Which wire rope to use on your equipment—which brand will give the longest and most economical service—may be best determined by past records of performance established under similar operating conditions. This and the reputation of the maker are of paramount importance.

FOR over half a century American Wire Rope, made exclusively by the American Steel & Wire Company, has demonstrated its superiority—proved beyond question that its tough, flexible and abrasion-resistant nature is the best insurance against breakdowns and costly delays.

Regardless of your particular problem, you will find an American Wire Rope exactly adapted to its economical solution. Consult our nearest branch office or distributor to get the right rope for your purpose.

AMERICAN
STEEL & WIRE COMPANY
WIRE ROPE

AMERICAN STEEL & WIRE COMPANY
SUBSIDIARY UNITED STATES STEEL CORPORATION
208 S. LaSalle St., Chicago 30 Church St., New York
Other Sales Offices: Atlanta Baltimore Birmingham Boston Buffalo Cincinnati Cleveland Dallas Denver Detroit Kansas City Memphis Milwaukee Minneapolis-St. Paul Oklahoma City Philadelphia Pittsburgh Salt Lake City St. Louis Wilkes-Barre Worcester
U. S. Steel Products Co.: San Francisco Los Angeles Portland Seattle Honolulu
Export Distributors: United States Steel Products Co., 30 Church St., New York City

SHOTS FROM THE FIRING LINE — Continued

Jack Kelly, well-known shovel operator, is doing his stuff with P. T. Pfeiffer's Bucyrus-Erie Gas + Air machine on a 150,000-yard road job at Valley Park, Missouri.

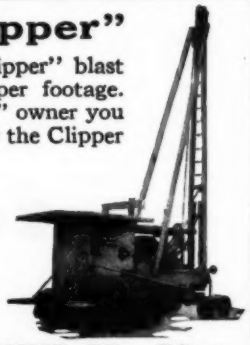
The accompanying illustrations give views of the operations on the thirty-million-dollar dam under construction at Bagnell, Missouri, on which exceptional progress is being made by the **Stone and Webster Engineering Corporation.** In connection with the excavation about the dam the above Bucyrus-Erie Gas + Air shovel, about seven months old, is being used continuously, moving from one job to another, first about the dam, then on road grading, then excavation for a club house, etc. Ben Ressler, long-time steam and straight gasoline operator, enjoys handling the Gas + Air, stating that she operates much more easily than any other shovel.

"Do you love me, Sadie?"
"You know I do, Herman."
"Herman? My name is Oswald."
"Why, so it is! Forgive me, darling, I keep thinking it's Saturday."

"Loomis Clipper"

You will find "Loomis Clipper" blast hole drills give you cheaper footage. Ask any "Loomis Clipper" owner you may know to tell you how the Clipper reduces his drilling costs.

Either round or crawler type wheel, welded steel or wood frame furnished. All steel machine if specified.



Established 1842

THE LOOMIS MACHINE CO. K Street Tiffin, Ohio

BONUS or PENALTY?

LINN Tractors are helping

Contractors to increase profits

Patent No. 1,270,531
" " 1,521,454
" " 1,685,641
" " 1,685,676
" " 1,701,979
Other Patents Pending.

When "Old Man Weather" has turned dry earth to muck and mire . . . when other hauling equipment cannot move . . . when progress is menaced by idle shovels . . . when *penalties* threaten profits . . .

LINN defies the elements and keeps the job on schedule, despite ground and grades . . . and it frequently wins the *bonus!* Because the LINN was designed for the tough jobs and built to work under difficult conditions, it can also lengthen the contractor's working season.

More and more, contractors are conquering weather and controlling profits by their choice of equipment. And more and more, they are putting the LINN tractor on their jobs. LINN is the only hauling unit that lays its own road as it carries pay load . . . the only tractor operating on *flexible* traction . . . the only tractor which transfers all weight to the ground through a moving anti-friction contained roller chain system.

LINN performance facts are available to anyone interested in more efficient and more economical heavy hauling. Write or wire for them.

LINN MANUFACTURING CORPORATION

Division of LaFRANCE-REPUBLIC Corporation

Manufacturers of American La-France Trucks, Linn Tractors, Republic Trucks

Factories: Alma, Mich. - Morris, New York

Represented in:

New York City	Boston	Philadelphia	Chicago	Tulsa, Okla.	Salt Lake City	San Francisco
Skowhegan, Maine	Charlotte, N. C.	Pittsburgh	St. Louis	Omaha, Nebr.	Denver	Portland, Ore.
New Haven, Conn.	Memphis, Tenn.	Louisville, Ky.	Kansas City, Mo.	Sioux Falls, S. D.	Jerome, Ariz.	Spokane
Baltimore	Johnson City, Tenn.	Detroit	Little Rock, Ark.	St. Paul, Minn.	Los Angeles	

105 direct distributors located throughout the United States and 49 distributors located in 30 foreign countries

Canadian Linn Distributors: Mussens Limited, Montreal

In writing to Linn Manufacturing Corp., Div. of La France-Republic Corp., please use post card bound in the center of this number.

SHOTS FROM THE FIRING LINE — Continued

Clark E. Jacoby Engineering Company, Kansas City, formerly located at 700 Interstate Building, are now in their new offices at 909 Fairfax Building.

HARRY RUSSELL

Many friends of Harry Russell, long-timed steam shovel operator, will regret the news of his untimely death on May 21st.

Mr. Russell was operating a Bucyrus-Erie 20-B steam shovel for Kunze Construction Company, St. Louis, on stripping overburden at the Limestone Quarry of Missouri Portland Cement Company. The shovel was close to the high bank of earth which unexpectedly caved in as the machine was swinging towards it from the dump truck. The terrific impact of the earth threw Mr. Russell against the gantry frame killing him instantly.

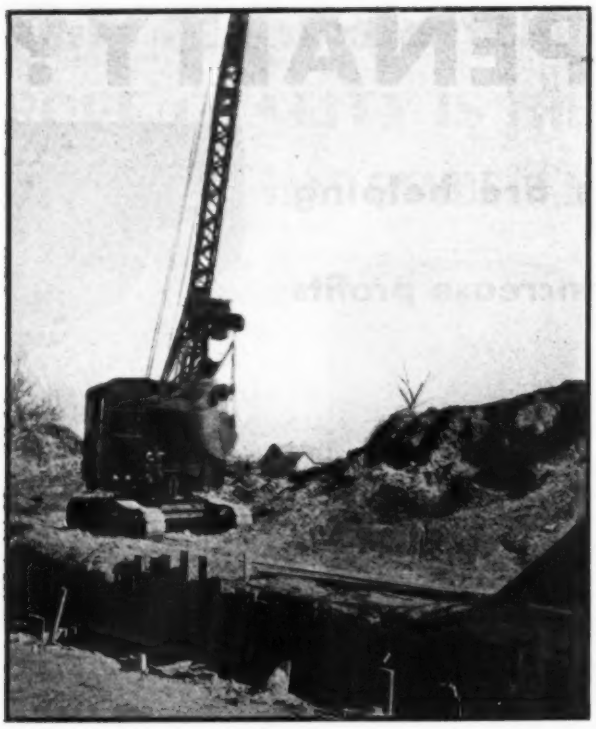
St. Louis Notes

BY A. J. KOENIG

The American Road Builders' Association will hold their 1931 show and convention in St. Louis. This centrally located metropolis with the New Arena is well prepared to take care of the Highway Builders. The main building is 475 by 276 feet. Two exhibition buildings 288 by 300 feet each. An open space totaling 148,000 square feet is available between the buildings and the railroad tracks for outdoor display. The railroad sidings adjoining the buildings have a capacity of fifty cars.

Welcome to St. Louis!

L. W. Bowen, Chief Engineer, City of St. Louis, will soon take bids for the construction of a 250-foot, five-span, reinforced concrete bridge and approaches across River Des Peres on Landsdowne Avenue.



3/8-Yard *Utility* Backfiller-Crane

The profits to be derived from investing in a 3/8-yard Utility Buckeye are made possible by its remarkably diversified working ability. Rapid convertibility—without drum lagging — to Clamshell, Crane, Dragline, Orange-peel or Backfiller, multiplies its service range.

Chief of its distinguishing mechanical features are: Two speeds for all operations, including traction; Twin Disc clutch controls; upper and lower bases both of one-piece electric steel castings; cable drums mounted on separate shafts; Timken roller bearings; adjustable-length boom; full-circle swing; and Buckeye steel tread Alligator crawler wheels with brakes for safe operation on grades.

Write for complete specifications and performance records of this compact, speedy Buckeye Backfiller-Crane which pays its way every day on some construction job or other.

The Buckeye Traction Ditcher Co.
FINDLAY, OHIO

There's a Buckeye Sales and Service Office Near You

for over thirty years **Buckeye**

GREDAG
REG. U.S. PAT. OFF.
LUBRICANTS

TAKE THE GRIND OUT OF GEARS—ADD LIFE TO BEARINGS

Demanded by operators whose practical tests cover many years of perfect service in all climates, under the most severe conditions.

Used and recommended by machinery manufacturers, on sound engineering advice and long experience.

Write for our book, "Industrial Lubrication".

ACHESON GRAPHITE CORPORATION
Unit of Union Carbide UCC *and Carbon Corporation*
NIAGARA FALLS, NEW YORK

"HERCULES" RED-STRAND
REG. U.S. PAT. OFF.
WIRE ROPE

Dependable

You can depend on "HERCULES" (Red-Strand) Wire Rope, because: (1) It is made of acid open-hearth steel wire; (2) Its every wire has been rigidly tested by us to make sure that its qualities are of the highest for wire rope purposes; (3) It is correctly designed; (4) It is made according to methods that insure equalized tension throughout.

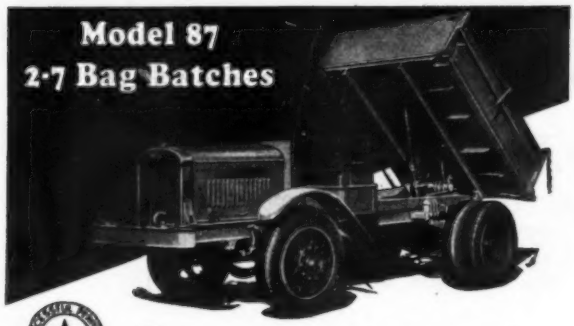
Economical

The same factors that make "HERCULES" (Red-Strand) Wire Rope dependable also make it long lasting, and you men who use wire rope know that its cost decreases as its life increases. Another very important advantage of a long-life wire rope is that fewer replacements are necessary, which means less idle time and steadier operation.

Made Only by **A. LESCHEN & SONS ROPE CO.** Established 1857

5909 Kennerly Avenue
ST. LOUIS

New York Chicago Denver San Francisco



HERE is a real 2—7 bag batch truck and four-yard bulk capacity that operates with single batch efficiency and agility. Short wheelbase with resultant equalized load distribution over all 4 wheels reduces bearing pressure on subgrade and minimizes subgrade maintenance.

Six-cylinder Buda engine, 5 speeds forward, 2 speeds reverse, double reduction rear axle, Hug triple compensating rear spring and I-beam frame are some of the salient features of construction.

There's a Hug for every Roadbuilding need.

Write us for details and specifications.

HUG

THE HUG CO., Highland, Illinois

Shifting Track on Waste Dumps

The above illustration is typical of the many applications of the Track Machine used for shifting track on waste dumps of quarries, open pit mines, construction jobs—wherever track must be shifted laterally. On all shifting and raising work, it takes the place of men working with jacks and bars.

Write for Bulletin GR-8.

NORDBERG MFG. CO., Milwaukee, Wis.

THE NORDBERG PATENTED TRACK MACHINE

SHOTS FROM THE FIRING LINE — Continued

C. J. Turpin, Vice-President of the Beaver, Meade & Englewood Railroad, Oklahoma City, awarded contract for the construction of forty miles of grading from Hough, Oklahoma, in a westerly direction, to The Panhandle Construction Co., Oklahoma City, Oklahoma.

The United States Engineers office at New Orleans received bids for approximately 6,000,000 yards of levee construction in the Second District. **Smith Construction Co. of Memphis** was low on two sections comprising 2,000,000 cubic yards.

On **Morgan & Watkins River Des Peres Sewer contract** in St. Louis three Type B Bucyrus-Erie steam shovels proved dirt-moving ability that is worth recording. Operator V. J. Tobias, who is pulling the levers on the 1926 Type B, sends us the above picture, and tells us that this "baby" averaged from 90 to 100 cubic yards per hour. Mr. Tobias says, "One Sunday I had all the transportation that Watkins owned, and actual pit measurement showed 1100 cubic yards in nine hours." As Amos and Andy would say, "H'm, ain't that somethun!"

St. Louis & San Francisco Railroad, Col. F. G. Jonah, Chief Engineer, received bids for the construction of a three-mile extension of the Shamrock branch northward to the Tidal Refinery, near Drumright, Oklahoma. This is a very heavy piece of grading. Estimate $120,000.

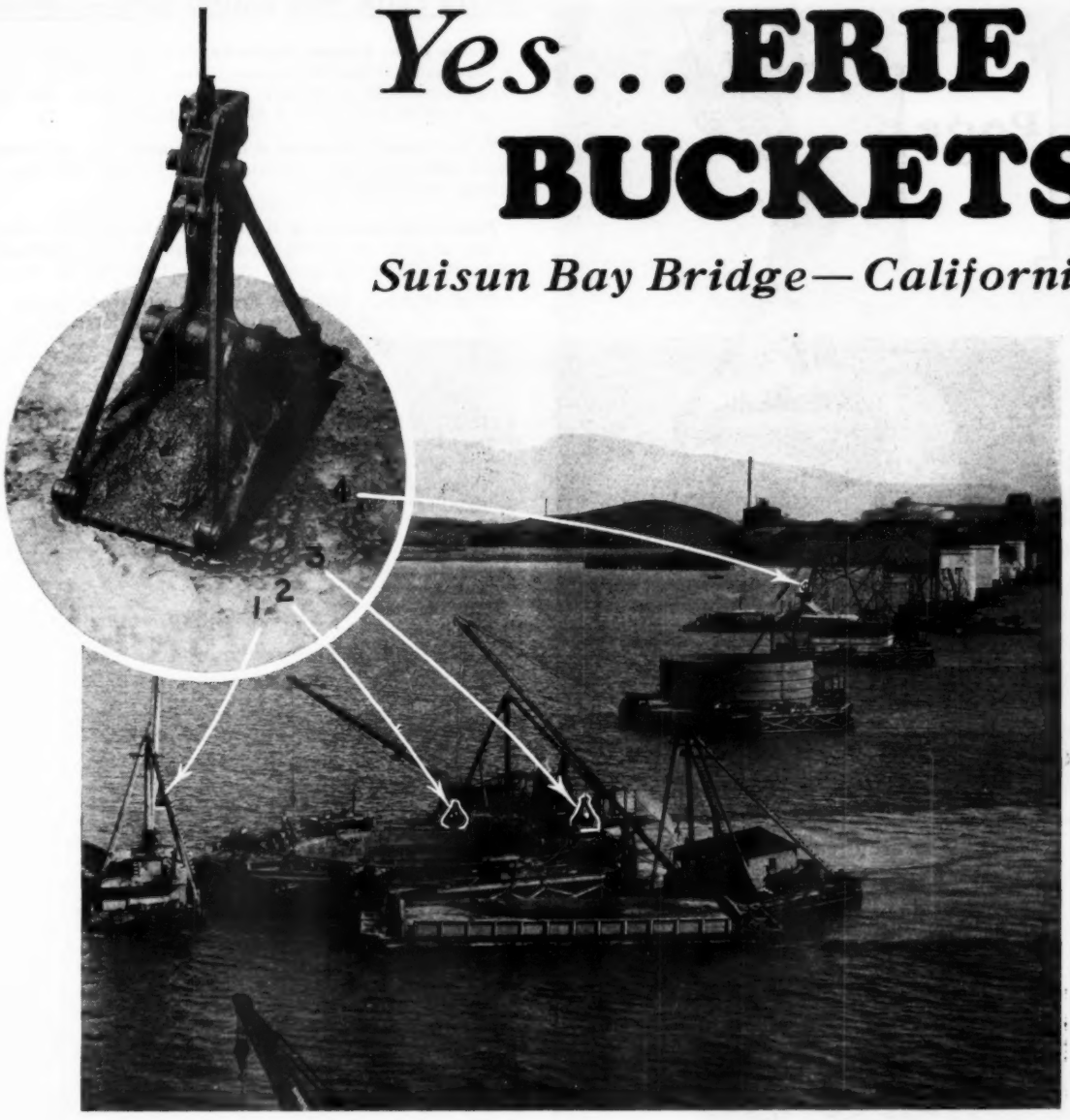
The above illustration shows one of **Gaines Brothers** Bucyrus-Eries at work on the grading of Highway 63 at Freeburg. This grading job is one of the largest grading contracts ever awarded in Missouri, and Gaines Brothers are to be complimented on the efficient manner in which the job has been organized and put under way. Beside the Bucyrus-Erie Diesel + Air shown above, they have two Bucyrus-Erie Gas + Air machines on this job.

Grading for the roadbed for the Cotton Belt Line between Caraway and Truman, Arkansas, has started. The Cotton Belt is building 22 miles of new road and is also rebuilding the Arkansas Short Line. Reid & Lowe of Memphis has sublet their contract to Hughey Bros. also of Memphis.

Nixon & Smith of Birmingham were awarded a nice grading and drainage job by the Tennessee Highway Commission. The contract calls for 18 miles of grading on Highway No. 18 near **La Grange.**

Yes... ERIE BUCKETS

Suisun Bay Bridge—California



143 Feet Under Water

Bed rock 143 ft. under water made necessary unusual methods of construction for this $12,000,000 bridge.

Sand, mud, blue clay, gravel and shale rock to a total thickness of 83 ft. must come up to make room for 105,000 cu. yds. of concrete and 1500 tons of reinforcing steel which was used in the piers. An unusual job to be sure — one that demanded the best equipment obtainable.

Four 1¼ cu. yd. Erie Buckets were selected by Siems-Helmers, Inc., St. Paul, Minnesota, who constructed the superstructure. The buckets were working continuously under adverse conditions, but the water, mud, sand, etc., prove no barrier to Erie dredging buckets.

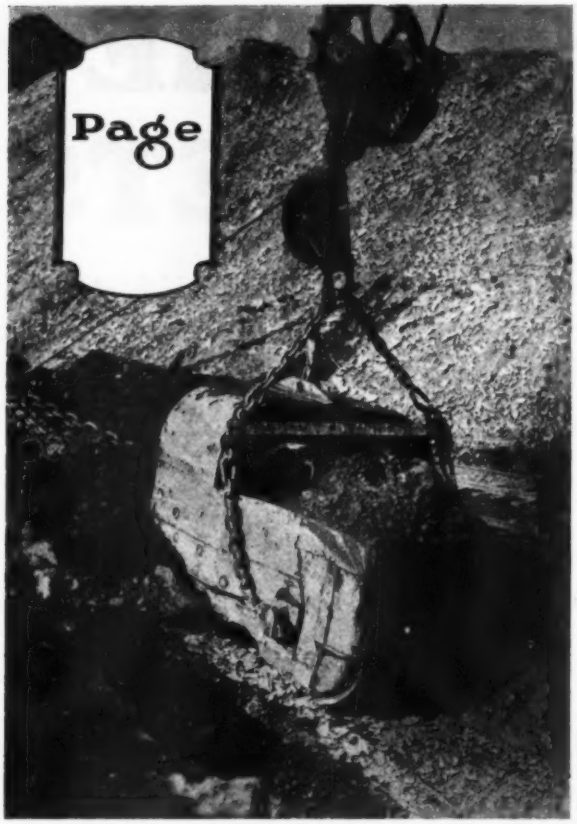
Your job may not be as difficult as this one. If you have Clamshelling to do Erie Buckets will do it better. Learn more about the buckets that will dig as well or better than any bucket of equal weight and parts of line and at a much greater speed.

They Selected ERIE BUCKETS

ERIE STEEL CONSTRUCTION CO.

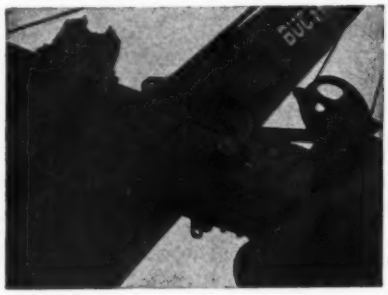
ERIE, PA.

In writing to Erie Steel Construction Co. please use post card bound in the center of this number.



Seconds Count . . .

and a power dipper trip will save *seconds* in each digging cycle.



In this day when buyers measure the digging cycle in *seconds* before purchasing, consider the added output of your shovel after a Bucyrus-Erie power dipper trip has been installed.

Always positive in action, giving trouble-free service, a Bucyrus-Erie power dipper trip will soon pay for itself—and then add profits to the day's work.

For your steam, Diesel or electric shovel—write to **Bucyrus-Erie Company, Specialty Department, South Milwaukee, Wisconsin,** for complete information and prices.

BUCYRUS ERIE

SHOTS FROM THE FIRING LINE — Continued

Woods Bros., Lincoln, Nebraska, have their outfits on two big dike jobs on the Mississippi River. One outfit is at the foot of Island No. 6 opposite Hickman, Kentucky, the other at the head of Island No. 8, below Hickman.

T. E. Newell, Michigan City, Indiana, has a ten-team fresno outfit idle. He is looking for a job and will ship his outfit anywhere any time.

Cameron-Joyce & Co. of Keokuk was awarded the contract for the grading of the Galesburg Yards for the Burlington Railroad. 700,000 yards of dirt are to be moved on this job.

Chief Highway Engineer Frank Sheets received bids for 187 miles of grading and paving in Illinois. Estimated cost of this work is $7,000,000.

Fine!

"If I cut a beefsteak in two," asked the teacher, "then cut the halves in two, what do I get?"

"Quarters," returned the boy.

"Good. And then again?"

"Eighths."

"Correct. Again?"

"Sixteenths."

"Exactly. And what then?"

"Thirty-seconds."

"And once more?"

"Hamburger."

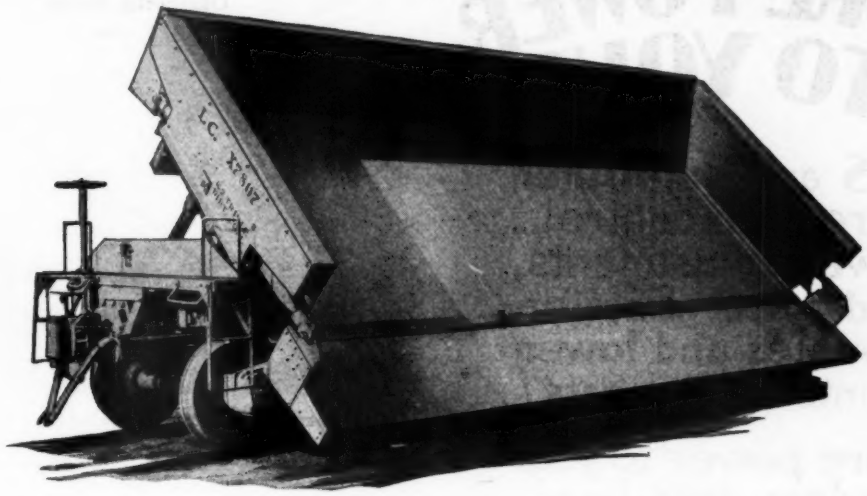
Kansas Notes

The accompanying views show the recent operations of the **Taylor Construction Company** of Salina, in laying 600 feet of sewer in a 20-foot ditch. The pictures were taken on the east end of Ash Street and give a pictorial story of how the job was handled. The sections of sewer pipe weighed 1800 pounds each, and the Taylor Construction Company's Bucyrus-Erie 1030 handled both the excavation and the placing of the pipe. Back filling was taken care of by a Byers Bearcat.

Geography Didn't Enter

His letter read: "I'm enjoying Florence immensely."

His wife replied: "You can stay in Europe. I am having a good time with Oscar."



Western Drop Door Dump Cars Build Cincinnati Union Terminal

ON this 6,000,000 cubic yard contract Western 30-yard drop door cars were chosen to haul the material. It is significant that experienced successful operators choose Western dump cars. They know the economy of having the best equipment for the purpose.

Western drop door cars were developed especially for the work normally encountered in open pit mining and heavy construction. They are exceptionally strong and long lived. They operate with economy, speed and safety. They are built in capacities of 20, 25 and 30 cubic yards for standard gauge track and of 10 cubic yards, 36-inch gauge. Why not let us tell you all about them? Write for Car Catalog 81-K which is just off the press.

WESTERN WHEELED SCRAPER COMPANY
AURORA, ILLINOIS, U. S. A.

WESTERN

One of the 122 Western Drop Door cars in use on the Cincinnati Terminal work.

In writing to Western Wheeled Scraper Co. please use post card bound in the center of this number.

"MORE POWER TO YOU!"

YES and **smoother** more even control... **fewer** adjustments, **reduced** friction troubles and **lower** maintenance costs!

More power to your dredges, drag-lines, hoists and steam-shovels — **GATKE ASBESGRAPHITE Moulded Brake and Friction Blocks get results!**

We supply sizes for all types of equipment.

Buy Direct from the Manufacturer

THOMAS L. GATKE

GATKE

ASBESGRAPHITE

MOULDED **BRAKE AND FRICTION BLOCKS**

Mail coupon below for Special Bulletin.

THOMAS L. GATKE, MANUFACTURER.
228 N. La Salle St., Chicago, Ill.
Please send us latest bulletin on Asbesgraphite Brake and Friction Blocks.

Name _____

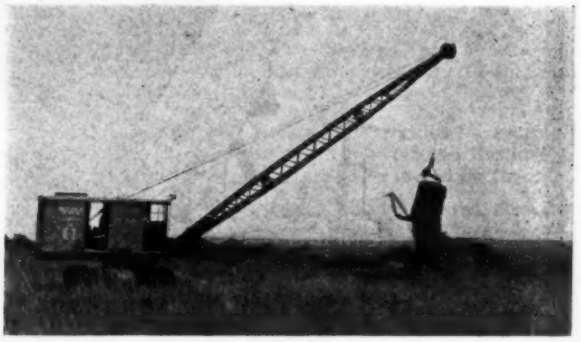
Address _____

_____

SHOTS FROM THE FIRING LINE — Continued

Oklahoma Notes

BY C. F. BARTON



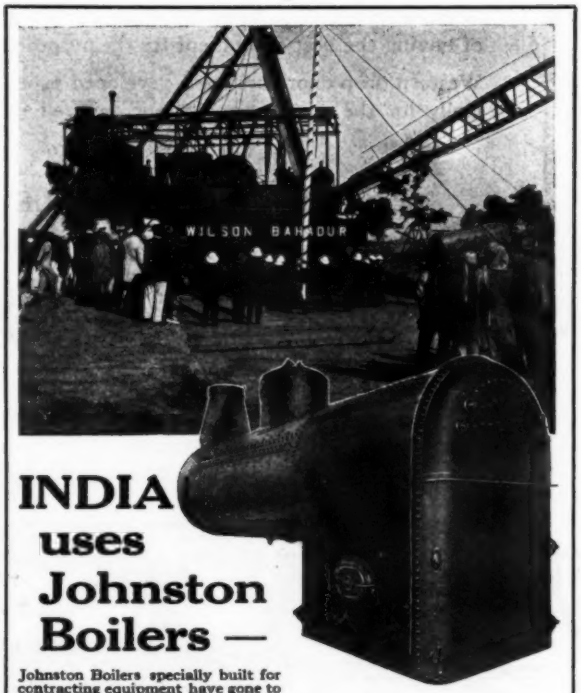
J. J. Harrison, Lindsay, Oklahoma, contractor is using the above Bucyrus-Erie E-2 dragline on his 750,000-yard drainage project, which will drain 7000 acres of land along the Washita River. The E-2 uses a 1½-yard Page Bucket and is going strong. Mrs. Harrison was out looking over the job when this picture was taken, and may be seen against the spoil bank just under the dragline boom.

Nevada Notes

A. D. Drumm, Jr. of Fallon, Nevada, was awarded contract for constructing a portion of the State Highway System in Humboldt County between Paradise Hill and Orovada.

Didn't Work

Ed: "Do you believe in the efficacy of prayer?"
Edna: "I would if you had gone home an hour ago."

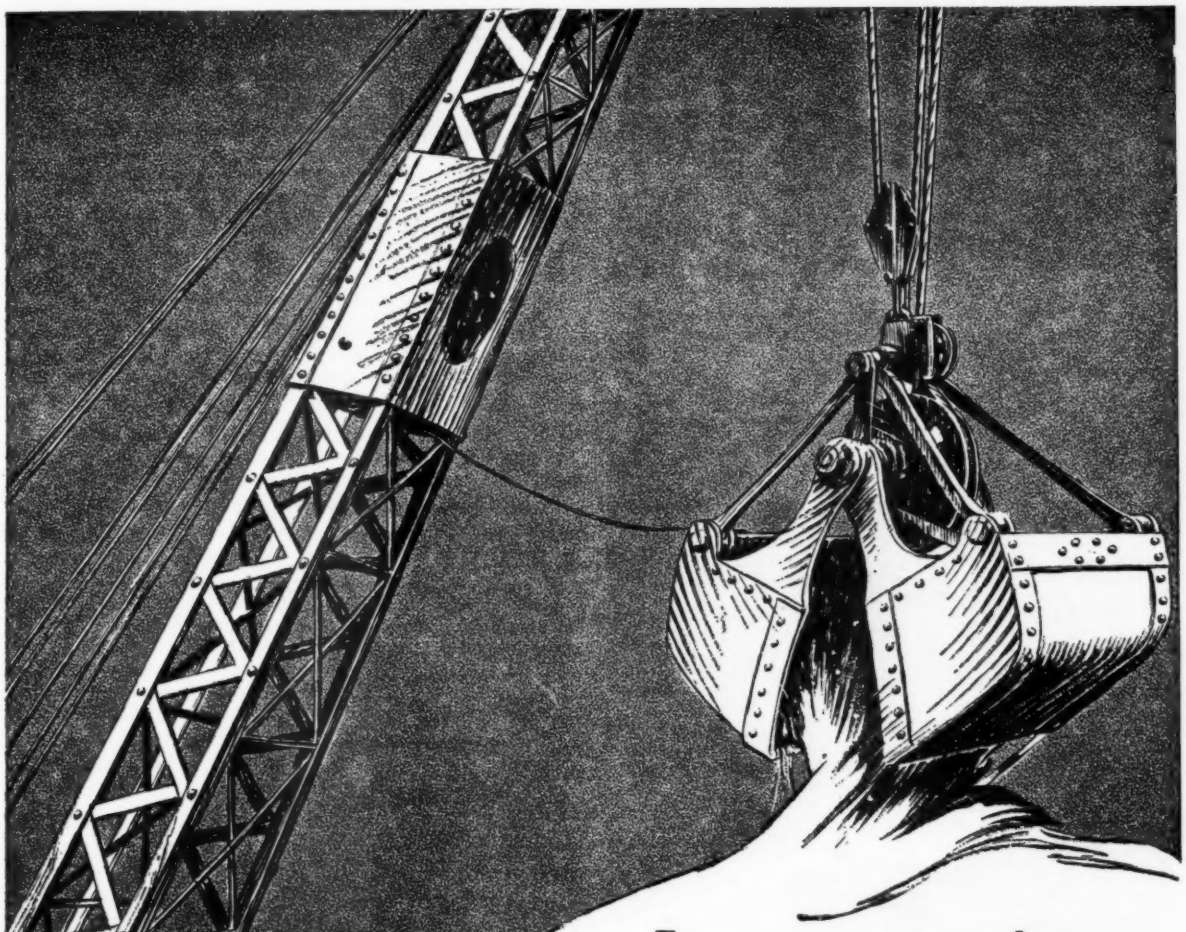


INDIA uses Johnston Boilers —

Johnston Boilers specially built for contracting equipment have gone to all parts of the world.

Thousands of them, during a period of over 65 years. Proof enough of quality, dependability and efficiency.

JOHNSTON BROTHERS, Inc.
FERRYSBURG, MICH.



Builders of the famous B. & B. Aerial Tramways for industrial haulage.

Important!

Which is most important—a reliable excavator, a reliable bucket, or reliable wire rope? As well ask which is the most important leg of a three-legged stool.

Yellow Strand Wire Rope, supreme in strength and elasticity, is a legitimate part (not accessory) of all heavy-duty excavating machinery.

Write for Catalog 51 and name of nearest distributor of B. & B. Ropes.

BRODERICK & BASCOM ROPE CO., St. Louis, Mo.

Eastern Office and Warehouse: 68-70-72 Washington St., New York City
Southern Warehouse: Houston, Texas
Western Office: Seattle—Factories: St. Louis and Seattle

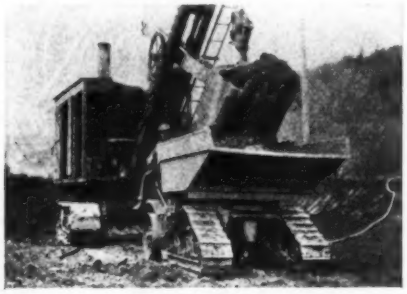
YELLOW STRAND WIRE ROPE

LR782

In writing to Broderick & Bascom Rope Co. please use post card bound in the center of this number.

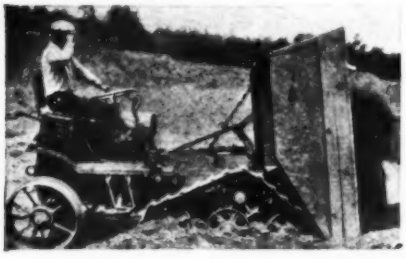
Moving a Granite Mountain

Here's a job to ruin any but the toughest, most powerful equipment — but the Hughes-Keenan 4-yard "Iron Mule" likes rough ground and huge granite chunks as well as sand. On Joseph P. McCabe's highway contract near Bar Harbor, Maine.



Right Under the Shovel

They're putting through new roads in New Brunswick, Canada, and 4 of these 4-yard "Iron Mules" are making it profitable for Currier & Seymour, contractors. Under the shovel, right to the edge of the fill, goes the "Iron Mule" without a waste motion.



Dumped Exactly Where Wanted

Straight to the edge of the fill — no jockeying, no guessing — step on power hoist lever, clean dump, body righted, off for another load. These 4-yard "Iron Mules" have boosted daily yardages for L. H. Bean, Inc., contractors, on a new highway near Hartford, Conn.

If you're moving any kind of dirt anywhere, get the profit story of "Iron Mules". Coupon makes it easy.

THE HUGHES-KEENAN COMPANY
MANSFIELD, OHIO

HUGHES-KEENAN
Steel Dump Bodies

The Hughes-Keenan Company, Mansfield, Ohio. 13

Gentlemen:

Please send me the whole "Iron Mule" story and tell me where I can see one in action.

Name_____

Address_____

City_____ State_____

SHOTS FROM THE FIRING LINE — Continued

Los Angeles and Vicinity

BY FORREST L. BEST

Bill McKinley of the Lewis Construction Company, Los Angeles, is busy moving equipment to their Arrowhead job at San Bernardino. Operators Robertson and Hopper are on the Bucyrus-Erie Diesel + Air shovels.

Leo Honek, Los Angeles, reports business very good in and around Los Angeles. At present he is operating three Bucyrus-Erie shovels; two steam and one Gas + Air. Operators Smith, Edwards and Jewell are at the controls.

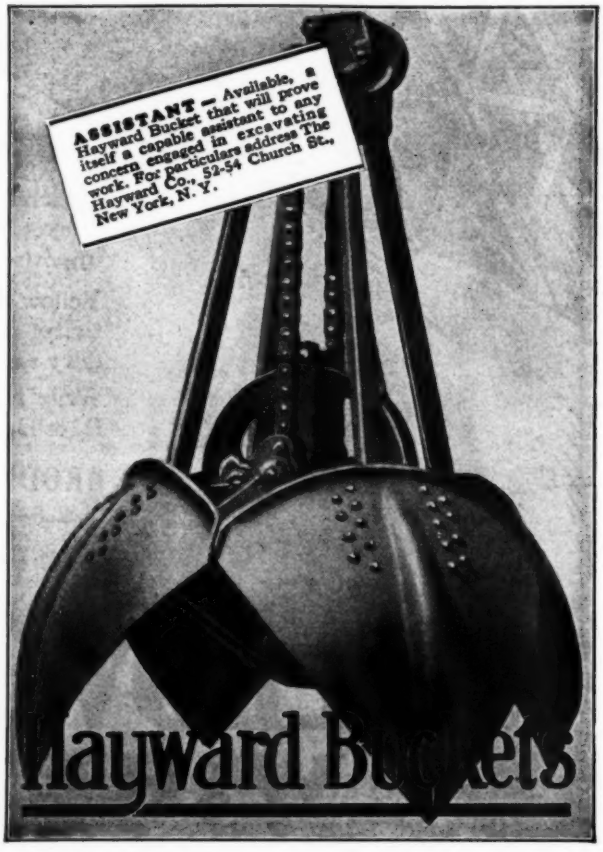
Carl Ingalls, Bakersfield, says "Happy days are here again" with all his equipment busy, which includes two Bucyrus-Erie machines, one 1030 and one Gas + Air. Operators are Fred and Walter Cody.

Martin Brothers, Long Beach, are coming along good with their Nevada State Highway job near Las Vegas. They are using a P. & H. shovel on their excavating.

Earnest Ward, Los Angeles, has finished the Rose Canyon State job at San Diego and at present has a Parsons 31 Ditcher on the San Diego City Water Supply job.

The H. W. Rohl Company, Los Angeles, has started its San Bernardino State job with Ben Wells, Superintendent. At present they are using a Lorain 75 shovel. They also were awarded contract for the construction of three tunnels by Los Angeles City for the extension of Figueroa Street to Riverside Drive. Aggregate length is 996 feet. Approximately 46.5 feet in width by 28 feet high. Concrete and tile lined.

Fred Nighbert, Bakersfield, has his Little Lake job about completed. Hartman Construction Company of Bakersfield are doing the excavating, using two Northwest shovels.


ASSISTANT — Available, a Hayward Bucket that will prove itself a capable assistant to any concern engaged in excavating work. For particulars address The Hayward Co., 52-54 Church St., New York, N. Y.
Hayward Buckets

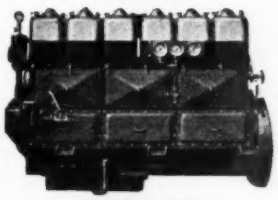
Can you handle tough jobs at a profit?

A Bucyrus-Erie D-2, powered with an Atlas Imperial Diesel, excavating for a logging road in Washington.

WHERE a gasoline engine normally stalls, under heavy load . . the Atlas Imperial Diesel digs-in and lugs. Uniquely, its lugging power (torque) increases under such conditions. Because, with its common rail fuel system, proper atomization is maintained constantly in the Atlas Imperial over the entire range of speeds.

10% to 15% greater yardage . . is the result. Besides . . you cut fuel costs from 75% to 90%. The Atlas Imperial Diesel burns only cheap, low-grade fuel oil, which costs ⅓ to ¼ as much as gasoline . . and it consumes ½ to ⅓ as much.

The 6-cylinder Atlas Imperial industrial full diesel.



USED IN

Bucyrus-Erie Excavators; P & H (Harnischfeger) Excavators; Link-Belt Excavators; Thew Excavators; Plymouth Locomotives; Lidgerwood Logging Equipment.

A full line of diesels . . . ranging from 20 H P to 500 H P . . . is manufactured by Atlas Imperial for all marine and industrial uses.

Instant starting and stopping — from stone cold to full load, in ten seconds . . absence of water troubles . . easier movements to and from jobs . . are a few of your advantages over steam.

Under the most severe conditions . . day-in and day-out . . from shift to shift . . the Atlas Imperial Diesel stands the gaff. Its world-wide reputation has been built on its sturdy ruggedness.

First to adapt and prove the diesel engine for excavators, tractors, industrial locomotives, logging engines, oil-well drilling and marine uses . . the Atlas Imperial Diesel Engine Co. is one of the pioneer diesel manufacturers of the country.

Investigate the Atlas Imperial Diesel . . before you buy another engine. Consult any of the companies listed here, or mail the coupon, for more information, direct to us . . Atlas Imperial Diesel Engine Co., Oakland, California.

ATLAS IMPERIAL
FULL DIESELS

BRANCH OFFICES: *New York · Chicago · New Orleans · Portland, Oregon · Houston, Texas · San Diego, Los Angeles, Terminal Island, California.*
DISTRIBUTORS: *Ferrier & Lucas, Vancouver, B. C. · Atlas Engine Co., Seattle · Fleck & Stelfox, Baltimore · L. R. Beatty, Philadelphia · T. Ralph Foley, Gloucester, Mass. · J. L. Latture Equipment Co., Portland, Ore. · Et. Davio, Papeete, Tahiti · A. B. Donald, Ltd., Auckland, N. Z. · W. Holmes, Sydney, N. S. W. · Honolulu Iron Works Co., Honolulu, T. H. · Lidgerwood Pacific Co., Tacoma, Wash.*

Atlas Imperial Diesel Engine Co., 2867 Glascock St., Oakland, California: Mail information on Atlas Imperial Full Diesels.

*Use*_____ *Name*_____ *Company*_____ *Address*_____

In writing to Atlas Imperial Diesel Engine Co. please use coupon or post card bound in the center of this number.

» » » WHAT DOES SAFETY IN CHAIN DEPEND ON? . . . .

● Safety in Chain depends upon two factors of *equal* importance. The first is, of course, use of the right chain—chain that is properly manufactured to fit the particular purpose for which it is to be used. It's needless to say—but TAYLOR-MADE chain *more* than meets this requirement. When you buy TAYLOR-MADE Chain you know that *each link* has been properly tested, and is sent to you ready for the most rigid tests to which chain can be put.

● The other factor of chain safety is one over which *you* only have control—proper care of chain *in use.*

● The following suggestions will help you with *any* chain you use:

a. Keep chain oiled — avoiding brittle or weakened surface skin caused by rust or corrosion.
b. Try not to apply load to chain suddenly.
c. Avoid severe bending and abuse of links in certain parts of the chain.
d. Try not to subject chain to prolonged exposure to dull red heat.

● If you take these precautions with chain you can be assured of a fair degree of safety with most chain and the highest degree of safety with TAYLOR-MADE Chain.

● You can learn more about TAYLOR-MADE CHAIN if you send for a copy of Catalog "A".

CHAIN THE STRONG LINK OF INDUSTRY THE CHAIN INSTITUTE

"BUY FROM YOUR LOCAL DISTRIBUTOR"

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P. O. Box 1297-B » Hammond, Ind.

ESTABLISHED 1873

SHOTS FROM THE FIRING LINE — Continued

Fredrickson & Watson and Fredrickson Bros., are making fine progress on their Bayshore Highway job near Belmont. Two 1½-yard gasoline shovels are handling the excavating.

C. G. Willis & Sons, Los Angeles, report good progress on the Tri-County job at Maricopa. Carl Gablin, Superintendent. They are using three Koehring and one Gas + Air Bucyrus-Erie.

Washington Notes

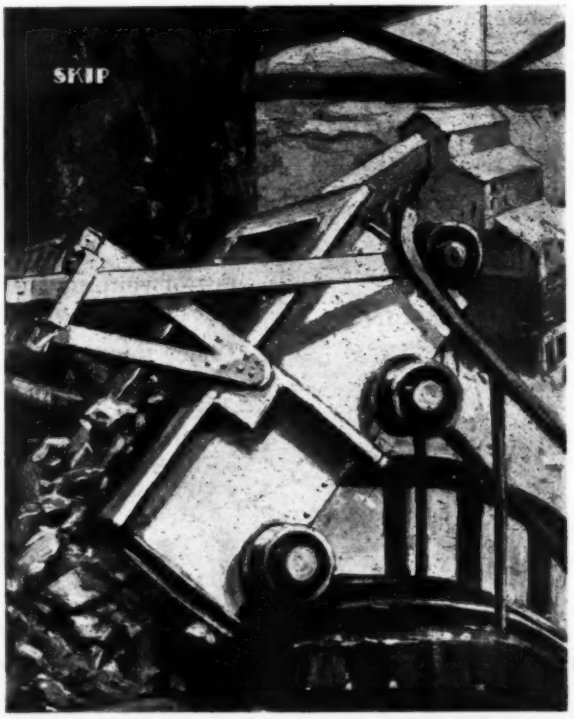
BY J. P. MC CLOSKEY

Northwest Construction Company, Seattle, with a bid of $59,831.71 was awarded contract for construction work on 2.8 miles of road on the Pacific Highway. 96,000 cubic yards of excavation and 9,000 cubic yards of crushed stone surfacing are included in the contract.

W. L. Giest of Spokane was awarded the grading and drainage on 1.2 miles of State Road No. 3 in the vicinity of Thornton in Whitman County at the April 29th letting. The work involves about 20,000 cubic yards of excavation, 120 cubic yards of concrete, 660 lineal feet of pipe culverts and other items. Mr. Giest bid the job at $12,383.40.

Clearing, grading and draining of 4.9 miles of State Road No. 8 between Goldendale to Summit in Klickitat County went to **Guy F. Atkinson Company of Portland** for $137,929.63. The work includes about 39 acres of clearing, 215,260 cubic yards of excavation, 670 cubic yards of concrete, 82,300 pounds of steel, 1,850 lineal feet of pipe culverts.

The Pacific Contracting Company of Raymond, Washington, took the clearing, grading, draining and surfacing with crushed stone on 0.6 miles of State Road No. 12 at the Nasel River Bridge Approaches in Pacific County. Among the items the job includes 21,600 cubic yards of excavation.

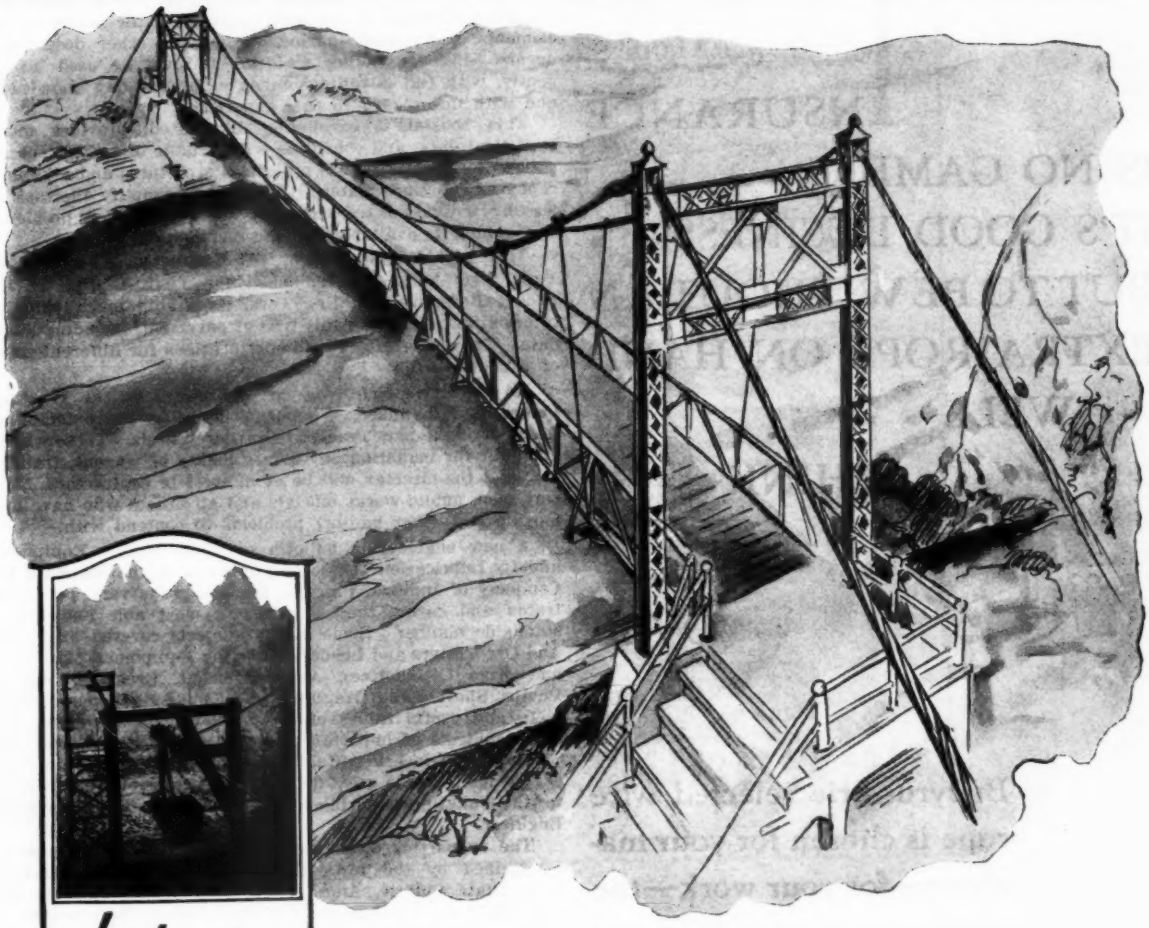


EASTON CARS

FOR EVERY PIT, MINE AND QUARRY

Easton Car and Construction Company
Easton, Penna.

WILLIAMSPORT



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for temporary and permanent use have sold themselves to engineers and highway builders everywhere. They are substantial, economical, easily erected, do not easily wash out and for permanency they will rate well with all other methods.

Write for literature and facts. If you have a bridge job—get our free engineering service and prices.

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INSURANCE
IS NO GAMBLE » »
IT'S GOOD BUSINESS » »
BUT TO BE WITHOUT AN
EXTRA ROPE ON HAND
»» WELL » »
THINK
IT
OVER

Bucyrus-Erie selected wire rope is chosen for your machine—for your work—the result of extensive field and laboratory study and tests.

Order your next wire rope from Bucyrus-Erie. You will be satisfied that proper selection is as important as proper care.

BUCYRUS-ERIE COMPANY
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BOOK REVIEWS

A booklet on shore protection has just been issued by the Portland Cement Association which deals with waterfront structures generally, and shows, by means of much illustrative material, how the protection problem has been successfully handled in various localities.

"Concrete Shore Protection" is the title of this 32-page publication. The introduction states that "of all materials available, concrete is the most resistant to the action of the elements, salt water, marine borers, and other destructive agents. Like any other material, it must be used intelligently, with full advantage taken of present-day knowledge, and with due regard to past experience."

This booklet is excellently illustrated, provides much statistical data, and concludes with a table of typical specifications for concrete shore protection structures and a bibliography of reference material intended to simplify the task of making individual research into shore protection problems. The volume is available for free distribution.

The Asphalt Association, 441 Lexington Avenue, New York, New York, has published the Fifth Edition of the Pocket Reference for Engineers, containing much valuable information relating to this type of pavement, including latest data. They have also issued specifications for different types of asphalt surfaces and bases.

An attractive eight-page circular issued by the **Trackson Company, Milwaukee, Wisconsin,** describes the outstanding features of the new Trackson Crawler Wheels. These wheels are built for mounting on various makes of wagons, trailers, etc., and the circular will be of interest to contractors, highway men, public works officials and all others who have dirt moving and other hauling problems to contend with.

A new engineering bulletin entitled "Mining Equipment and Its Lubrication" has been published by the **Standard Oil Company of Indiana, Chicago, Illinois.** It is very well illustrated and covers the subject in a most able and understandable manner. Some of the subjects covered are: Coal and Ore Cutters and Loaders, Hoisting Equipment, Mine Cars and Mine Locomotives, Air Equipment, Crushers, Motors, Pumps, Shovels and Draglines, and Tipple Equipment. Complete and useful tables of recommendations are given and other subjects of importance, such as Rust Preventives, are covered. Engineering Bulletins prepared by the Standard Oil Company are in great demand, but if possible your request for this bulletin will be filled. Please mention **The Excavating Engineer.**

The supporting strength of concrete-incased clay pipe as determined by the Iowa Engineering Experiment Station, Iowa State College, Ames, Iowa, in co-operation with the Clay Products Association, Chicago, Illinois, is reported in Bulletin 93 of the experiment station.

It was found that the safe supporting strength of concrete-incased clay pipe is only slightly greater than the sum of the individual supporting strengths of the clay pipe and of the concrete incasement. The supporting strength of the incased pipe was found to be higher at lower temperatures. The action of an incased pipe is very nearly that of two independent but concentric rings, results indicated.

Tests indicated that the strength of a concrete specimen is influenced to a marked degree by the temperature at which it is tested. Specimens tested at 1 degree F. were found to have about double the ultimate strength of specimens made and cured under the same conditions but tested at 70 degrees.

It has just been announced by the **Division of Simplified Practice, of the Bureau of Standards, Department of Commerce,** that the printed booklet on Simplified Practice Recommendation No. 1—**Paving Brick** (Seventh Edition) is now available.

An examination of this booklet, copies of which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 10 cents a copy, discloses that the simplification program for this product has effected a reduction of variety from 66 sizes and types to 5 or approximately 92 per cent.

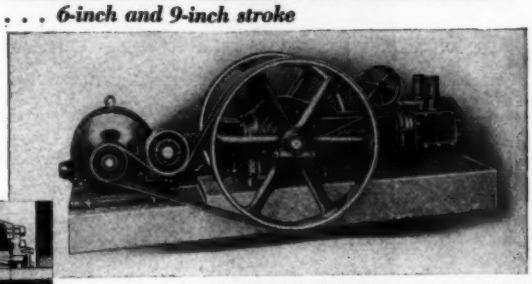
(Continued on page 367.)

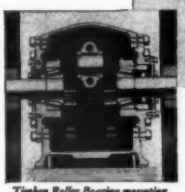
In writing to Bucyrus-Erie Company please use post card bound in the center of this number.

Now... TIMKEN BEARING EQUIPPED

Worthington Horizontal Compressors

. . . 6-inch and 9-inch stroke





Timken Roller Bearing mounting on crankshaft journals

Timken Bearings require no adjustment for years . . . an important feature for the compressor user whose equipment is attended by unskilled operators

COMPRESSOR users will readily appreciate the significance of this announcement . . . it means that they can now have the reliability and efficiency of Worthington Feather Valve Compressors in combination with the economy, carefree operation and other well-known advantages of Timken Roller Bearings.

This equipment is available in sizes employing 6-inch and 9-inch stroke, in capacities of 100 to 300 cu. ft. per minute.

The adoption of Timken Bearings is evidence of Worthington's policy of incorporating, in all of its products, those features of construction which mean increased satisfaction to the user.

If you are not familiar with Worthington Compressors and their numerous features of advanced design, ask the nearest branch office for full information.

WORTHINGTON

PUMPS
COMPRESSORS
CONDENSERS *and* Auxiliaries
DIESEL ENGINES
GAS ENGINES
FEEDWATER HEATERS
WATER, OIL *and* GASOLINE METERS

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WORTHINGTON

A Timken Advertisement By Worthington

"Increased satisfaction to the user" is the spirit of the message contained in this announcement.

Worthington knows—as every manufacturer of Timken-equipped machinery knows—that "Timken Bearing Equipped" is a dominant factor in improved performance, reduced costs and greater endurance—for Timken is *the one bearing that does all things well* —whether the loads are all *radial,* all *thrust or a combination of both.*

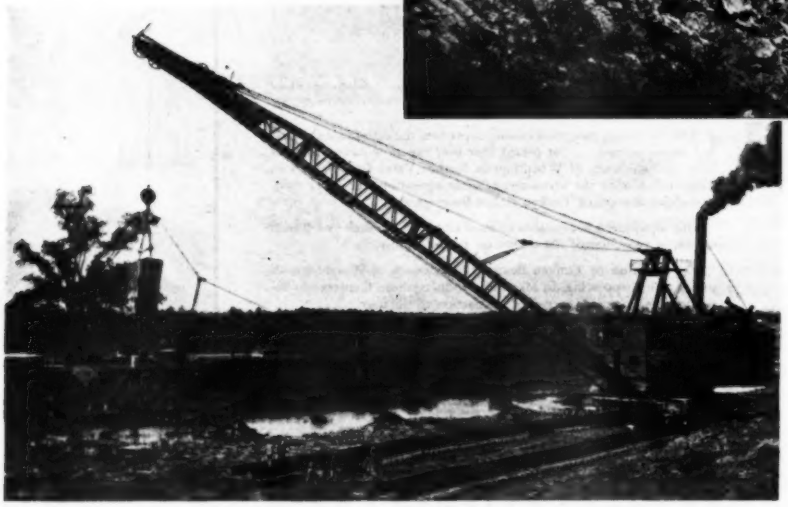
TIMKEN

TRADE MARK REG. U. S. PAT. OFFICE

In writing to The Timken Roller Bearing Company please use post card bound in the center of this number.

Levee Construction on Upper Morganza and Upper New Texas

(Continued from page 332.)



Above: Six more yards going into the river side of levee. Land side section is in place and core ditch may be seen between the two in right background. Left: Placing fifteen-foot track section.

pit and casting to a spoil pile, on the levee side. A second trip along the section being built and on the opposite side of this spoil bank, swings this spoil into the land side of the levee section. A third trip digs the second cut of the borrow throwing it into the river side of the levee. The fourth and last trip digs the section of the borrow closest to the levee placing in the valley between cast from the second or rehandling trip and the third or middle borrow cut. This last trip with the 230 finishes the levee to required profile on the three-trip operation.

In moving the machines from job to job they are loaded without dismantling on barges and towed up or down the river.

Lewis-Chambers Construction Co., Inc., feels that continued service over a long period of time, and not a record-breaking week or month, constitutes the true test of a machine. And the Lewis-Chambers levees are comparatively further advanced than others along the river, which were started at approximately the same time. Both Mr. Lewis and Mr. Chambers divide their time between their office in New Orleans and supervision of the levee building. "The record of production of the Bucyrus-Erie machines," said Mr. Chambers, "has so far been superior, or at least equal, to any machine at present on the river. For a period of one and one-half years, the two machines, which have been in constant service for twenty-four hours a day, have maintained a steady, reliable, constant output, assuring consistent work."

Government engineers in charge of the Upper Morganza, and the Upper New Texas levees are Major W. H. Holcombe, District Engineer in charge of 2nd New Orleans District; W. A. Wells, Area Chief Engineer; W. B. Kirby, Resident Engineer and Leon Vignes, Inspector.

Mr. Cranwell, Please!

Operator J. E. Cranwell, recently with the Gillum Cooper Company, Cumberland, Kentucky, very kindly sent us photographs which we used in April. Mail directed to Operator Cranwell has been returned from both Cumberland and Pineville, Kentucky. We would like to know his present address so we may pay him for the photographs used. Can any reader help us?

Here lies the bones of Nancy Jones,
For her, life had no terrors,
She lived a maid, and died a maid,
No hits — no runs — no errors.

BOOK REVIEWS — Continued

A new chain information book just out has evidently been prepared with great care for it gives in a most concise way facts and figures concerning all types of Welded Chain.

There are elaborate tables of sizes, weights, loads and directions for taking measurements. It also tells how to order chain in accordance with the A. S. T. M. and A. R. A. Specifications with excerpts from these specifications. The book contains the Rules and Cautions issued by the Chain Institute.

It is a book that should be in the files of every engineer and organization interested in chain and may be had by addressing the **American Chain Company, Inc., Bridgeport, Connecticut.**

TRADE NOTES

The American Manganese Steel Company and subsidiary company, the **Southern Manganese Steel Company,** recently opened an office in the Law and Finance Building, Pittsburgh, Pennsylvania. W. G. Hoffman, in charge, will handle the sale of both Amsco Manganese Steel castings and Fahralloy heat and corrosion resisting castings in this territory.

Jean M. Allen & Co., contracting and consulting engineers, recently announced the removal of their offices to 75 E. Wacker Drive, Mather Tower, Chicago, Illinois.

Bucyrus-Erie Company, South Milwaukee, announces the removal of the New York sales offices to Suite 1300, 270 Broadway, from their former location at 50 Church Street.

The Broderick and Bascom Rope Company, St. Louis, Missouri, recently moved into their new offices at 4203 North Union Boulevard. The site of the spacious new building adjoins the St. Louis factory of the Company.

Among the new distributors who have been appointed recently by the **Trackson Co., Milwaukee, Wis.,** to handle Trackson tractor equipment for McCormick-Deerings is the **Gierke-Robinson Co.,** 4th and Ripley Sts., Davenport, Iowa, who will cover the Davenport, Des Moines, Cedar Falls, Fort Dodge, Mason City and Dubuque territory. **Zimmerman-Steeples Equipment Co.,** 269 East Water Street, Portland, Oregon, has been appointed distributor in that territory. These firms will carry a complete line of Trackson Crawlers, Shovels, Loaders, Bulldozers, Hoists, etc., as well as a stock of repair and replacement parts.

R. G. Elliott, 631 Chapel Street, New Haven, Connecticut, has been **appointed by The Reading Chain & Block Corp.,** Reading, Pennsylvania, to handle their entire line in the State of Connecticut.

Bucyrus-Erie Company, South Milwaukee, recently announced the representation in Cleveland and vicinity of Stein & Ainlay, 1017 Fidelity Mortgage Building, Cleveland.

The New York Office of the Lima Locomotive Works, Inc., has been removed to 60 East 42nd Street, New York, New York.

The Texas Company recently announced the removal of its New York offices to 135 East 42nd Street.

Kratz & McClelland, San Francisco,, have been appointed as agents in Northern California by the G. H. Williams Co., Erie, Pennsylvania, manufacturers of clamshell buckets and heavy-duty trailers. Kratz & McClelland will be able to render prompt and capable service from complete warehouse stocks.

MEETING PLACE OF CAPITAL AND LABOR

THE KOENIG LABOR AGENCIES

Established 1875

ST. LOUIS
612 Walnut Street
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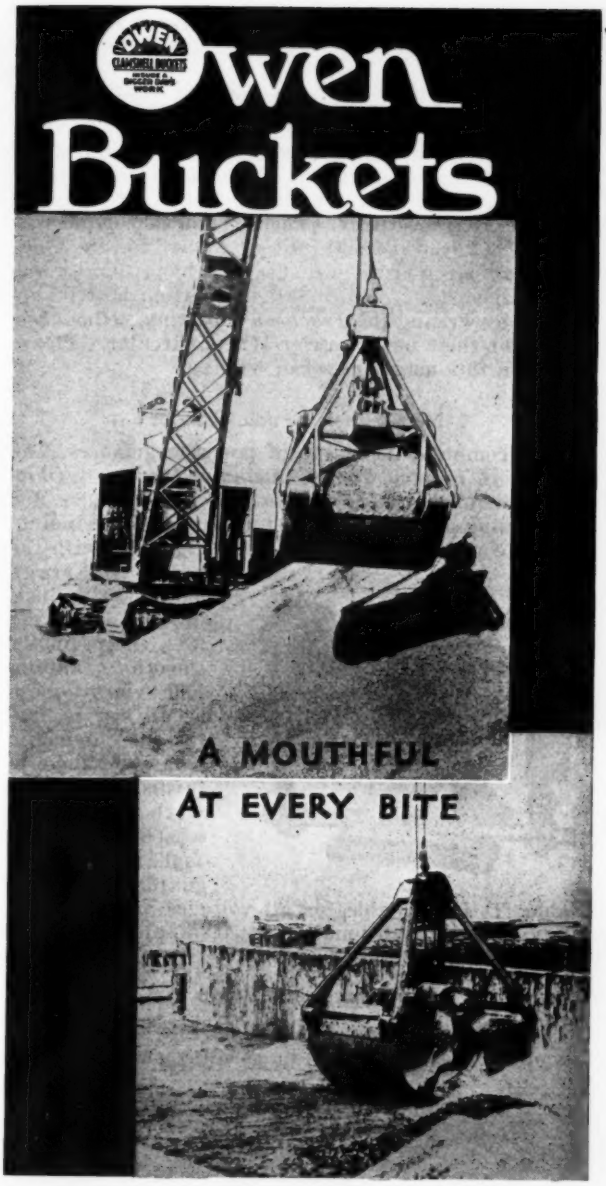


AND MORE BITES PER DAY

Here's a combination that gets the job done with no time lost. Add to that the labor-saving ability to clean-up as it goes along, and you have the real reasons why Owen Type "S" Rehandling Buckets provide a bigger day's work than any other bucket of the same weight and capacity.

THE OWEN BUCKET CO.

6026 Breakwater Ave., Cleveland, Ohio

Equipment You Ought To Know About

(Continued from page 343.)

withstand the hard wear and the shocks and strains to which equipment of this kind is subject.

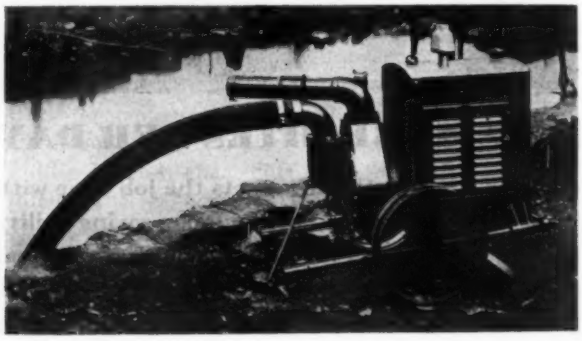
Trackson Crawler Wheels may be installed on almost all makes of wagons. They are manufactured in four sizes, with six, ten, fifteen and twenty-ton load capacities, respectively. The ten and fifteen-ton size wheels will be of special interest to dirt movers, since they can be used on wagons with from five to ten-yard capacities. Additional information may be obtained by writing the *Trackson Company, Milwaukee, Wis.*, for their new Crawler Wheel Circular. Please mention this magazine when writing.

New 7-inch Bench Grinder

To complete their line of portable grinders, *The Van Dorn Electric Tool Company of Cleveland, Ohio,* has announced a new 7-inch Bench Grinder for sharpening all sorts of edge tools and light grinding. It is a compact, sturdy, ball-bearing grinder with the ball bearings mounted in dust-proof housings. It is exceptionally smooth running and vibrationless at all speeds, due to its dynamic balance, and is furnished complete with grinding wheels, adjustable tool rests, wheel guards, switch and cable. It is available for all voltages and currents. In writing for additional information, please mention this magazine.

New 4-inch Pump

A new self-priming portable 4-inch centrifugal pumping unit with built-in gasoline engine has recently been added to their line of portable equipment by the *Homelite Corporation, Port Chester, N. Y.* The pump is self-priming, without use of auxiliary pumps or vacuum apparatus. Capacity is 25,000 gallons per hour, suction lift is 20 feet. The bronze impeller is of the open type. Powered by a Le Roi 8-10 h.p., 4-cylinder gasoline engine, the complete unit weighs 730 pounds and is priced $600 f. o. b. Port Chester, N. Y. When writing to the manufacturer for additional information, please mention this magazine.



New Portable Hoist

Ingersoll-Rand Company has introduced a new-sized "Utility" Portable Air Hoist of 2000 pounds capacity. For the past three years "Utility" Hoists, in capacities up to 1500 pounds, have been used by miners and contractors. The addition of the 2000-pound size makes this type of hoist available for additional classes of work.

The uses for "Utility" Hoists are varied. In mines they are used for hoisting timbers, tools, pipe, and drill steel into stopes and raises; hauling and spotting cars, hoisting muck, etc. Many of the same uses for the hoist are found in quarries and smelters as well. In construction work they are used on derricks for hoisting buckets in caisson work, pulling cars, skidding timbers, handling pipe, and operating clamshell or orange-peel buckets. They can also be used for hoisting material, erecting tanks and smokestacks, pulling sheet piling, and driving piles.

The hoists are of comparatively light weight, which permits them to be readily moved about wherever there is work to be done. They can be bolted to a timber or mounted on a post or steel column in any convenient location. For additional information write *Ingersoll-Rand Company, 11 Broadway, New York City.*

United States Crushed Stone Production for Year Would Circle Globe with Sidewalk 1 Foot Thick and 9 Feet Wide

It is a safe assertion that few people in the United States have a very definite conception of the enormous amounts of crushed rock produced annually in the country. According to a recent announcement by the *United States Bureau of Mines, Department of Commerce,* 95,000,000 short tons of crushed stone were produced by the nation in 1927. This quantity of crushed rock, considering that the rock weighs 165 pounds to a cubic foot, would mean a cube of solid rock about 1050 feet, or ⅕ of a mile, on an edge — that is, a cube whose edge is almost twice as high as the Washington Monument or 1½ times as tall as the Woolworth Building. If it were made into a mass 10 feet square, it would reach approximately 2200 miles, or about the distance from Chicago to San Francisco. It would make an automobile road composed of a solid sheet of rock 20 feet wide and a foot thick which would reach from the most northern coast of North America to the South Pole. If it were made into a single piece one-foot square, it would reach around the globe almost nine times. In other words, it would make a stone sidewalk almost 9 feet wide and 1 foot thick the entire distance around the earth at the equator.

"Who recalls when nobody but some colored people drank gin?"